

3.14 HYDROLOGY AND WATER RESOURCES

This section addresses three types of hydrology and water resources—floodplains, surface water, and groundwater—that have the potential to be affected by the proposed alternatives. In addition, water quality issues are briefly addressed in relation to surface and groundwater resources. This section describes the existing hydrologic resources within the five regions and generally identifies the potential for impacts from each alternative and high-speed train (HST) alignments and station options on those resources. The analysis identifies the number and general extent of areas of hydrologic resources that potentially would be affected by the various alternatives for purposes of comparison.

3.14.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

Several federal and state laws regulate and are designed to protect hydrologic resources, floodplains, and water quality. Below is a list of these statutes. (See Appendix 3.14-A for brief descriptions of these authorities.)

Federal Laws and Regulations

Clean Water Act (33 U.S.C. § 1251 *et seq.*): The purpose of the federal Clean Water Act (CWA) is restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters through prevention and elimination of pollution. The CWA applies to discharges of pollutants into waters of the U.S. The following CWA sections are most relevant to this analysis.

Section 10 of the Rivers and Harbors Act (33 U.S.C. 401 *et seq.*): Section 10 of the Rivers and Harbors Act, administered by the U.S. Army Corps of Engineers (USACE), requires permits in navigable waters of the U.S. for all structures such as riprap and activities such as dredging. Navigable waters are defined as those subject to the ebb and flow of the tide and susceptible to use in their natural condition or by reasonable improvements as means of interstate transport or foreign commerce. USACE grants or denies permits based on the effects of navigation. Most activities covered under this act are also covered under Section 404 of the CWA.

Executive Order 11988—Floodplain Management (U.S. DOT Order 5650.2; 23 C.F.R. 650, Subpart A): Executive Order (EO) 11988 directs all federal agencies to seek to avoid to the extent practicable and feasible all short-term and long-term adverse impacts associated with floodplain modification and to avoid direct and indirect support of development within 100-year floodplains whenever there is a reasonable alternative available.

Projects that encroach upon 100-year floodplains must be supported with additional specific information. The U.S. Department of Transportation Order 5650.2, titled "Floodplain Management and Protection," prescribes "policies and procedures for ensuring that proper consideration is given to the avoidance and mitigation of adverse floodplain impacts in agency actions, planning programs and budget requests." The order does not apply to areas with Zone C (areas of minimal flooding as shown on Federal Emergency Management Agency [FEMA] Flood Insurance Rate Maps [FIRM]). Environmental review documents should indicate potential risks and impacts from proposed transportation facilities.

Flood Disaster Protection Act (42 U.S.C. 4001–4128; DOT Order 5650.2, 23 C.F.R. 650 Subpart A; and 23 C.F.R. 771): The purpose of the Flood Disaster Protection Act is to identify flood-prone areas and provide insurance. The act requires purchase of insurance for buildings in special flood-hazard areas. The act is applicable to any federally assisted acquisition or construction project in an area identified as having special flood hazards. Projects should avoid construction in, or develop a design to be consistent with, FEMA-identified flood-hazard areas.

State Laws and Regulations

California Department of Fish and Game Code (§ 1601–1603 [Streambed Alteration]): Under Sections 1601-1603 of the Fish and Game Code, agencies are required to notify the California Department of Fish and Game (CDFG) prior to implementing any project that would divert, obstruct, or change the natural flow or bed, channel, or bank of any river, stream, or lake.

Porter-Cologne Water Quality Act (Water Code § 13000 *et seq.*): The Porter-Cologne Act is the basic water quality control law for California, and it provides for the State Water Resources Control Board (SWRCB) to implement the CWA for California.

Cobey-Alquist Flood Plain Management Act (Water Code § 8400 *et seq.*): The California Reclamation Board provides policy direction and coordination for the flood control efforts of state and local agencies along the Sacramento and San Joaquin Rivers and their tributaries in cooperation with USACE. It cooperates with various federal, state, and local government agencies in establishing, planning, constructing, operating, and maintaining flood-control works. The California Reclamation Board also exercises regulatory authority to maintain the integrity of the existing flood-control system and designated floodways by issuing permits for encroachments.

B. METHOD FOR EVALUATION OF IMPACTS

Impact Evaluation

Potential impacts on hydrologic resources, floodplains, and water quality were evaluated using a combination of both qualitative and quantitative assessment methods. The existing conditions as described for the No Project Alternative provide the primary basis of comparison. Appendix 3.14-B provides a discussion of the impact ratings and summarizes the potential impacts.

Qualitative Assessment

A qualitative assessment was used to compare the alternatives when discussing issues such as runoff rates, sedimentation, or other items that would ultimately require a more detailed analytic approach (i.e., at the project level if the decision is made to proceed with the proposed HST system) than appropriate for a program-level analysis. For these items, the differences in impacts between the Modal and HST Alternatives are explained in general, qualitative terms.

Quantitative Assessment

For the quantitative assessment, readily available information on wetland areas, stream locations, existing water quality problem areas, flood zones, and general soil information was used to estimate the magnitude of the potential areas of impacts for the alternatives. The following steps were followed to estimate the potential areas of impact for floodplains and water quality from the No Project, Modal, and HST Alternatives.

- Acreage of floodplains defined as Special Flood Hazard Areas, as defined by FEMA on Flood Insurance Rate Maps, in the study area was identified and estimated to evaluate the area of floodplain potentially impacted by the alternatives.
- Acreage of surface waters (lakes) and the linear feet of surface waters (rivers and streams) in the study area was estimated, using U.S. Geologic Survey (USGS) 1:24,000 scale digital line graphs of blue-line streams, including ephemeral streams. The linear feet of surface water was calculated based on the flow-path length of rivers and streams in the study area to evaluate areas potentially affected by the alternatives. Lake surface areas represent the impoundment at maximum capacity.
- Waters with impaired water quality, i.e., waters identified on the Section 303(d) CWA list distributed by SWRCB, in the study area were identified.

- Acreage of areas of potential soil erosion in the study area was estimated to evaluate areas potentially affected by the alternatives. The calculations included those areas with a combination of erosive soils and steep slopes, evaluated as the product of *kfact* and *slopeh* (listed in the State Soil Geographic-STATSGO GIS database). Those conditions where *kfact* x *slopeh* is greater than 3.0 are potentially susceptible to erosion. *kfact* designates the soil erodibility factor (including rock fragments) and *slopeh* indicates the soil slope.

The quantities of each type of hydrologic resource that could fall in the study area of either the Modal Alternative or the HST Alternative were estimated for each of the regions based on these steps.

3.14.2 Affected Environment

A. STUDY AREA DEFINED

Potentially Affected Area

The potentially affected area for hydrology and water quality is defined as 1) the area within 100 ft (30 m) of the centerline of the proposed HST Alternative alignments and within 100 ft (30 m) of the direct footprint of proposed new station facilities; and 2) the area within 100 ft (30 m) of the Modal Alternative direct corridor footprint and direct footprint of facilities, including corridors and facilities that would undergo upgrades/expansions.

Representative Impacts

The representative impacts were identified according to the actual corridor or facility footprint as follows:

- HST Alternative
 - 0' in tunnels
 - 50' total width in aerial and at-grade
- Modal Alternative
 - 20' on each side of existing highway facility (40' total width) for 1 new lane/direction
 - 40' on each side of existing facility (80' total width) for 2 new lanes/direction

Topography and Climate

The topography of the hydrology study area ranges from flat coastal and valley areas to mountain ranges, as discussed in Section 3.13, Geology and Soils. On average, about 75% of California's annual precipitation falls between November and March; 50% occurs between December and February. Northern California is much wetter than southern California, with more than 70% of California's average annual precipitation and runoff occurring in the northern part of the state (California Department of Water Resources 2003).

B. GENERAL DISCUSSION OF HYDROLOGY AND WATER RESOURCES

Floodplains

Floodplains are land next to a river that becomes covered by water when the river overflows its banks. FEMA designates and maps floodplains. In support of the National Flood Insurance Program (NFIP), FEMA has undertaken flood hazard identification and mapping to produce Flood Hazard Boundary Maps, Flood Insurance Rate Maps, and Flood Boundary and Floodway Maps. The zone of interest for the analysis of hydrologic resources in this program-level evaluation is defined as a special flood hazard area (SFHA) or Zone A, which is the flood insurance rate zone

that corresponds to the 100-year flood hazard area in the hydrologic resource study area. Figures 3.14-1 and 3.14-2 provide maps showing SFHAs in the general vicinity of the hydrologic resources study area.

Floodplains are important because they provide floodwater storage and attenuate the risk of downstream flooding, typically provide important habitat for native species (discussed in Section 3.15, *Biological Resources and Wetlands*), improve water quality by allowing filtration of sediments and other contaminants, and may provide locations for groundwater recharge.

Floodplains encompass floodways, which are the primary areas that convey flood flows. Floodways are typically channels of a stream, including any adjacent areas. NFIP has introduced the concept of floodways and floodplains to assist local communities in floodplain management. The floodway is the channel of a stream, including any adjacent floodplain areas that must be generally kept free of encroachment so that the 100-year flood can be carried without substantial increases to flood heights. The area between the floodway and the 100-year floodplain boundary is referred to as the floodway fringe. Any approved encroachment may take place within the floodway fringe. According to guidelines established by FEMA, increase in flood height in the floodway due to any encroachment in the floodway fringe areas may not exceed 12 in (30.48 cm), provided that hazardous velocities are not produced in the water body. Constructing levees, rail and road embankments, buildings, etc., that encroach on floodplains may reduce the flood-carrying capacity and increase flood elevations.

Surface Waters

For this analysis, surface waters include improved flood control or drainage channels, intermittent river and stream channels, permanent river and stream channels, ponds, lakes, reservoirs, coastal estuaries and lagoons, and sloughs. In addition, other human-made water features include aqueducts and salt evaporating ponds.

The California State Water Project is a water storage and delivery system of reservoirs, aqueducts, power plants, and pumping facilities. Its main purpose is to store water and distribute it to urban and agricultural water suppliers in northern California, the San Francisco Bay Area, the San Joaquin Valley, the central coast, and southern California. The State Water Project includes about 660 mi (1,062 km) of open canals and pipelines.

The federal Central Valley Project (CVP) is a long-term project for the storage and delivery of waters of the Sacramento River basin in the north for use in the San Francisco Bay Area, the farmlands of the San Joaquin Valley, and other metropolitan areas in the south.

The CVP's primary purposes include flood control; improvement of navigation on Central Valley rivers; development of hydroelectric power, irrigation, and municipal and industrial water supply; protection of the Sacramento-San Joaquin River Delta from seawater encroachment; and protection and enhancement of fish and wildlife.

Streams and lakes are important for fish and wildlife, for water supply, and because they convey floodwaters and may contribute to or attenuate the risk of downstream flooding. They provide important habitat for native species and may support wetland and riparian habitats (discussed in Section 3.15, *Biological Resources and Wetlands*), provide direct pathways connecting to downstream ecological or human resources, and provide locations for groundwater recharge.

Lagoons and estuaries are sheltered, semi-enclosed, brackish bodies of water along shorelines where fresh and salt waters interface through tidal flows and currents. Pollution from storm water runoff, industrial discharges, and boats can damage these resources, especially if their tidal flow is limited, naturally or otherwise. Of the areas being studied in this document, only the Los

Angeles to San Diego via Orange County (LOSSAN) region includes lagoons and estuaries. The amount, frequency, duration, and quality of freshwater flows affect the salinity levels, which in turn dictate the types of biological resources associated with a particular water body. Figures 3.14-3 and 3.14-4 provide maps showing surface waters in the general vicinity of the hydrologic resources study area. (See Section 3.15, *Biological Resources and Wetlands*, for a discussion of wetlands).

Groundwater

Groundwater is found in subsurface water-bearing formations. A groundwater basin is defined as a hydrogeologic unit containing one large aquifer or several connected and interrelated aquifers. Groundwater basins, which do not necessarily coincide with surface drainage basins, are defined by surface features and/or geological features such as faults, impermeable layers, and natural or artificial divides in the water table surface. The elevation of groundwater varies with the amount of withdrawal and the amount of recharge to the groundwater basin. Groundwater basins may be recharged naturally as precipitation infiltrates and/or artificially with imported or reclaimed water. Shallow groundwater is subject to potential impacts from dewatering during construction.

Figures 3.14-5 and 3.14-6 provide maps showing groundwater basins within the general vicinity of the hydrologic resources study area.

C. WATER QUALITY

Surrounding land uses affect surface water and groundwater quality. Both point-source¹ and nonpoint-source² discharges contribute contaminants to surface waters. Pollutant sources in urban areas include parking lots and streets, rooftops, exposed earth at construction sites, and landscaped areas. Pollutant sources in rural/agricultural areas primarily include agricultural fields and operations.

The impacts of nonpoint-source pollutants on aquatic systems are many and varied. Polluted runoff waters can result in impacts on aquatic ecosystems, public use, and human health from ground and surface water contamination, damage to and destruction of wildlife habitat, decline in fisheries, and loss of recreational opportunities. Small soil particles washed into streams can smother spawning grounds and marsh habitat. Suspended small soil particulates can restrict light penetration into water and limit photosynthesis of aquatic biota. Metals and petroleum hydrocarbons washed off roadways and parking lots, and fertilizers, pesticides, and herbicides from landscaped areas, may cause toxic responses (acute or long-term) in aquatic life, or may harm water supply sources such as reservoirs or aquifers.

Erosion

Potential impacts on water quality may result from construction activity (e.g., grading, which removes vegetation, exposing soil to wind and water erosion). A potential erosive condition occurs in areas with a combination of erosive soil types and steep slopes. Erosion can result in sedimentation that ultimately flows into surface waters. Contaminants in runoff waters may include sediment, hydrocarbons (e.g., fuels, solvents, etc.), metals, pesticides, bacteria, nutrients, and trash. Figures 3.14-7 and 3.14-8 provide maps showing areas with soils susceptible to erosion in the general vicinity of the hydrologic resources study area.

¹ *Point source* is a stationary location or fixed facility, such as the end of a pipe, from which pollutants are discharged. (U.S. Environmental Protection Agency 2002.)

² *Nonpoint source* pollution is caused by rainfall moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even underground sources of drinking water (U.S. Environmental Protection Agency 2002).

Impaired Waters

Some water bodies have been given special status under the CWA. Section 303(d) of the CWA requires each state to identify waters that will not achieve water quality standards after application of effluent limits, and to develop plans for water quality improvement. For each water body and pollutant for which water quality is considered impaired, the state must develop load-based (as opposed to concentration-based) limits called total maximum daily loads (TMDLs). TMDL is the maximum amount of pollution (both point and non-point sources) that a water body can assimilate without violating state water quality standards. Priorities for development of TMDLs are set by the state, based on the severity of the pollution and the beneficial uses of the waters. The U.S. Environmental Protection Agency's (EPA's) TMDL program provides a process for determining pollution budgets for the nation's most impaired waters. Pollutant loading limits are set and implemented by SWRCB under the Porter-Cologne Act. The program includes development of water quality standards, issuance of permits to control discharges, and enforcement action against violators.

D. HYDROLOGY AND WATER RESOURCES BY REGION

Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley.

Floodplains: As delineated by FEMA, 100-year floodplains have been mapped along the streams bordering San Francisco Bay, along Coyote and Suisun Creeks, and along the Guadalupe, Pajaro, Sacramento, San Joaquin, and Merced Rivers and their tributaries.

Surface Waters: Major streams and surface waters in the study area in this region include San Francisco Bay and the Guadalupe, Pajaro, San Joaquin, and Merced Rivers. The study area also includes Lake Merritt Tidal Channel, Quarry Lakes, extensive tidal flats and salt evaporating ponds in the South Bay, and the estuaries of Coyote Creek and Guadalupe River. The Hetch Hetchy and California Aqueducts, Don Castro and San Luis Reservoirs, San Felipe Lake, and O'Neill Forebay are also located in the study area in this region. Many of the streams and creeks in this region are considered impaired waters. Orestimba Creek and the surrounding watershed has been designated as an aquatic resource of national importance.

Groundwater: Groundwater is present in two distinct areas in the Bay Area to Merced region. Relatively uniform, unconfined aquifers and associated water tables are expected in the two valleys at either end of the proposed alignments, the Central Valley to the east and the San Francisco Bay/Santa Clara Valley to the west. Groundwater in these basins is routinely pumped for domestic and agricultural purposes and is subject to long-term fluctuations in water levels due to overdraft and recharge conditions. Groundwater is generally considered shallow in recharge/discharge areas near the San Joaquin River and its tributaries in the Central Valley, near San Francisco Bay, and in the area of the Sacramento-San Joaquin River Delta. Occurrence of groundwater in the Diablo Range would likely be influenced by fracture patterns and rock type.

Sacramento to Bakersfield

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield.

Floodplains: In the study area in the Sacramento to Bakersfield region, 100-year floodplains exist along most of the minor creeks and streams in rural areas. In urban areas and along most of the reaches of the major rivers, the 100-year floodplains are contained within the riverbanks. Levees and floodwalls have been constructed in urban areas, restricting the river flows. Upstream dams

also control many of the rivers. Land in certain low-lying rural areas is subject to frequent shallow flooding.

Surface Waters: more than two dozen rivers flow in this region, including the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, Fresno, San Joaquin, Kings, Kaweah, Tule, and Kern Rivers. Additionally, the study area along the west side of the Central Valley includes a portion of the California Aqueduct, the San Luis Canal, and the Sacramento-San Joaquin Delta. Groundwater and surface water are pumped to and from these and many other surface canals and drains that deliver irrigation water to and from agricultural fields throughout the region. The canals are packed earth or concrete-lined and generally lack the meanders, vegetation, biota, and other features of natural streams.

Groundwater: Groundwater levels in the Central Valley fluctuate with seasonal rainfall, withdrawal, and recharge. The large demand for groundwater has caused subsidence in some areas. Depth to groundwater in the study area in this region ranges from a few inches to more than 100 ft (30 m). Most of the groundwater in the region is present in unconfined or semi-confined aquifers as a part of the Sacramento Valley and San Joaquin Valley groundwater basins. Most areas have, at best, moderate recharge capability because infiltration is limited by clay or hardpan layers in the surface soils or subsurface materials.

Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles.

Floodplains: In the Bakersfield to Los Angeles region, 100-year floodplains exist along most of the minor creeks and streams in the rural areas south of Bakersfield and north of Palmdale. Land in low-lying rural areas is subject to frequent shallow flooding. While not within the 100-year floodplain, canyon areas through the Tehachapi Mountain range may be subject to flooding from storms.

Surface Waters: The major rivers, streams, and lakes in the region are the California and Los Angeles Aqueducts, Pyramid Lake, and the Santa Clara and Los Angeles Rivers. Smaller creeks and streams exist south of Bakersfield and north of the urban area of Los Angeles County. Seasonal washes and canyons are found within the study area.

Groundwater: Groundwater in this region includes three regional groundwater basins consisting of the Basin and Range, California Coastal Basin, and Central Valley aquifer systems. The depth of these aquifers varies by location. Relatively uniform, unconfined aquifers and associated water tables are expected in the two valleys at either end of the proposed alignments, the San Fernando Valley to the south and the San Joaquin Valley to the north. Groundwater in these basins is routinely pumped for domestic and agricultural purposes and is subject to long-term fluctuation in water levels due to overdraft and recharge conditions. Groundwater in the mountainous regions between the points represented by the San Gabriel and Tehachapi Mountains is highly variable, affected by fracture permeability in rock units and local alluvial valleys that are relatively restricted in their extent.

Los Angeles to San Diego via Inland Empire

This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas and south to San Diego generally along the I-215 and I-15 corridors.

Floodplains: In this region, the FEMA-designated 100-year floodplains are mapped around significant drainage channels in the Ontario area or riparian areas between March Air Reserve Base (ARB) and Temecula.

Surface Waters: The major rivers in the region include the Los Angeles, San Gabriel, Santa Ana, San Jacinto, San Luis Rey, San Dieguito, and San Diego Rivers, and the Rio Hondo Channel. Other major water resources include the California, Riverside Canal, San Diego, and Val Verde Tunnel–Colorado River Aqueducts. Seasonal washes and canyons are common. Lake Hodges and Lee Lake are also in the study area. Of these resources, the Los Angeles, San Gabriel, and Santa Ana Rivers are considered impaired waters.

Groundwater: Groundwater generally occurs in two distinct areas in the region. Relatively uniform, unconfined aquifers and associated water tables are expected in the Los Angeles basin, which includes all of downtown Los Angeles and extends east to just west of Ontario. Groundwater in the mountainous regions (the Peninsular Ranges province), from the Los Angeles basin to the tip of Baja California, is highly variable, controlled by fracture permeability in rock units and local alluvial valleys that are relatively restricted in their extent.

Los Angeles to San Diego via Orange County

This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing I-5 highway corridor.

Floodplains: As delineated by FEMA, 100-year floodplains in the region are associated with significant drainage channels or riparian areas just south of Anaheim, or are within coastal areas just south of Camp Pendleton to San Diego.

Surface Waters: The rivers and channels in the region include Los Angeles, San Gabriel, Santa Ana, Santa Margarita, San Luis Rey, San Dieguito, and San Diego Rivers and Rio Hondo Channel. Other water resources include Buena Vista, Agua Hedionda, Batiquitos, San Elijo, and San Dieguito Lagoons, and San Diego and Mission Bays.

Water bodies with impaired water quality in the region include the Los Angeles, San Gabriel, Santa Ana, Santa Margarita, and San Luis Rey Rivers, and the Rio Hondo Channel. The rivers are considered impaired because they exceed standards for algae, ammonia, metals, chloroform count, pesticides, nutrients, toxicity, trash, and/or sedimentation. The lagoons and the San Diego and Mission Bays are also considered impaired because of declining water quality, increased freshwater input, accumulated sediment, diminished biological productivity, and water circulation constraints.

Groundwater: The California Coastal Basin Aquifer is the primary aquifer identified in the region. Groundwater depth within the region varies from a few feet to more than 100 ft (30 m). Perched aquifers with a shallow water surface occur throughout Los Angeles and Orange Counties. Shallow groundwater is also likely adjacent to or in the vicinity of streams, rivers, lagoons, and bays.

Two varieties of groundwater are found along the coastal areas. The first is perched water, which infiltrates and percolates through the sandy terraces, then becomes perched on or within less porous bedrock units. This contributes to the instability of the Del Mar and San Clemente coastal bluffs. Efforts to control the instability have included improvements to the storm drain system, surface drainage, and sub-drains. The second variety of groundwater is subsurface water that saturates surface and formational materials in the vicinity of alluvial or estuarine environments, such as the mouths of the major drainage areas and lagoons.

3.14.3 Environmental Consequences

Potential impacts on hydrology and water resources which may result from the alternatives or the proposed HST system alignment and station options include potential encroachment on or location in a floodplain, potential impacts on water quality, potential increased/decreased runoff and stormwater discharge due to changes in the amount of paved surfaces, potentially increased or decreased contribution of nonpoint-source contamination from automobiles, and potential impacts on groundwater from dewatering or reduction of groundwater recharge.

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The existing conditions assume that the effects of the current built environment on hydrologic resources and water quality would continue. The No Project Alternative assumes that in addition to existing conditions, planned and programmed transportation improvements would be constructed and operational by 2020. The potential impacts of the No Project Alternative on hydrologic resources and water quality are assumed to be limited because typical design and construction practices would need to meet permit conditions. However, some impacts on hydrologic resources would likely result from the implementation of the projects under the No Project Alternative, such as increased runoff from added lanes of paved surface and new columns for expanded bridges over rivers and streams. However, attempting to estimate these potential changes would be speculative. It is assumed that project-level environmental documents and permits would be prepared by project proponents for future projects that would affect hydrologic resources and water quality. These project-level documents would identify and analyze, and avoid, minimize, or mitigate potential impacts on hydrology and water quality to the extent feasible.

It is assumed that existing conditions would not change substantially, and thus the existing conditions serve as the baseline to which the impacts from the Modal Alternative and HST Alternative would be added.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HST ALTERNATIVES

It is assumed that any improvements associated with the Modal and HST Alternatives would be in addition to those included in the No Project Alternative. Based on available information for the study area, there is a substantial difference in the estimated acreage and linear feet of hydrologic resources that would potentially be crossed by the Modal Alternative compared to the HST Alternative (as shown in Table 3.14-1). These estimated areas of potential impacts on hydrologic resources and water quality would not provide a primary means of differentiating among the potential impacts of alternatives, because neither alternative presents significant potential impacts that cannot be substantially avoided, minimized, or mitigated through conventional design and construction processes, and compliance with permits and best management practices (BMPs) required for project permits. For instance, it is expected that streams and rivers would largely be spanned by bridges (culverts also can be used) to minimize potential impacts on the flow and water quality of these hydrologic resources. Further, potential impacts on water quality from surface runoff or erosion during project construction would be identified during the project-specific analysis and the design phase, and standard BMPs would be used to minimize potential impacts. The primary difference between alternatives would be the cost to bridge over streams and rivers, tunnel under wetland areas, or construct elevated guideways to minimize potential impacts on surface flow.

Areas with identified sensitive habitat, such as the Don Edwards San Francisco Bay National Wildlife Refuge (National Wildlife Refuge), the San Francisco Bay and salt marshes, and the Diablo/Pacheco Pass area near Gilroy, are discussed in Section 3.15, *Biological Resources and Wetlands*. These areas have streams and wetlands that provide potential habitat to special-status species. Avoiding or minimizing impacts on hydrologic resources and riparian corridors would be an important factor in

selecting a corridor as a preferred alternative that is expected to include a least environmentally damaging alternative.

Table 3.14-1 summarizes the potential area of the various hydrologic resources within the potentially affected areas that were examined as part of this evaluation. In most cases, the area and extent of the potential direct impacts would be a function of an alternative's alignment, or alignment option in the case of the HST Alternative.

To represent the potential for direct impact to water and biological resources for the System Alternative (Modal and HST), a GIS analysis has been completed for the approximate footprint of the alternative facilities. For the HST Alternative, this analysis identified and quantified potential direct impacts based on the representative alignments within the broader GIS envelopes used to identify the potentially affected resources. For the Modal Alternative, this analysis identified and quantified potential direct impacts for the highway improvements only. The quantifications are representative of the unmitigated potential for direct impacts that could occur within the corridor. See Table 3.14-1A. This analysis focused on non-wetland waters (streams/rivers and lakes/other bodies of water). Subsequent project level engineering and environmental studies would focus on avoidance and minimization of potential impacts.

Table 3.14-1
Summary of Hydrologic Resource within Potentially Affected Areas

Region	Floodplains in Acres (Hectares)	Streams in Linear Feet (Meters)	Lakes ^a in Acres (Hectares)	Erosion in Acres (Hectares)	Groundwater in Acres (Hectares)
Modal Alternative					
Bay Area to Merced	2,872 (1,162)	2,039,748 (621,715)	663 (268)	2,954 (1,195)	14,128 (5717)
Sacramento to Bakersfield	2,235 (905)	161,599 (49,255)	17 (7)	^b	16,642 (6,735)
Bakersfield to Los Angeles	125 (51)	46,362 (14,131)	32 (13)	3,016 (1,221)	1,276 (516)
Los Angeles to San Diego via Inland Empire	238 (96)	118,210 (36,030)	14 (6)	615 (249)	^b
Los Angeles to San Diego via Orange County (HST corridor equivalent)	115 (47)	1,410 (430)	0	95 (38)	0
Los Angeles to San Diego via Orange County (conventional rail corridor equivalent)	95 (38)	6,915 (2,108)	5 (2)	1,335 (540)	Low
Modal System-wide Totals ^d	5,540 (2,242)	2,367,329 (721,562)	726 (594)	6,680 (2,703)	32,046 (12,969)
High-Speed Train Alternative					
Bay Area to Merced	305–781 (123–316)	270,057–453,248 (82,313–138,150)	80–226 (32–91)	1,698–2,797 (687–1,132)	2,621–3,995 (1,061–1,617)

Region	Floodplains in Acres (Hectares)	Streams in Linear Feet (Meters)	Lakes ^a in Acres (Hectares)	Erosion in Acres (Hectares)	Groundwater in Acres (Hectares)
Sacramento to Bakersfield	994–2,150 (402–870)	97,657–147,406 (29,766–44,929)	0–2 (0–1)	^b	7,265–11,018 (2,940–4,459)
Bakersfield to Los Angeles	322–424 (130–172)	29,568–70,880 (9,012–21,604)	0–18 (0–7)	2,974–3,661 (1,204–1,482)	1,665–2,100 (674–850)
Los Angeles to San Diego via Inland Empire	224–423 (91–171)	53,030–84,120 (16,164–25,640)	9–10 (4–4)	490–838 (198–339)	^b
Los Angeles to San Diego via Orange County (HST corridor)	20–95 (8–38)	1,950–4,565 (594–1,391)	0	210–465 (85–188)	0
Los Angeles to San Diego via Orange County (conventional rail corridor) ^d	295 (119) (Lower-level improvements)	11,210 (3,417)	12 (5)	^b	^b
	225 (91) (Higher-level Improvements)	12,105 (3,690)	11 (4)	^b	^b
HST System-wide Totals	1,865–3,873 (755–1,567)	452,262–760,219 (137,850–231,715)	89–256 (36–104)	5,372–7,761 (2,174–3,141)	11,551–17,113 (4,675–6,925)
<p>^a Includes lagoons in the LOSSAN region.</p> <p>^b Numeric data not available.</p> <p>^c The number of potential conflicts associated with the HST Alternative is provided as a range of potential conflicts. For each region, the HST Alternative generally includes various proposed alignment options within each segment of the region. These routes serve only to provide a reasonable range of impacts for comparative purposes and do not represent any selection of a particular option as preferred.</p> <p>^d Analyzed by distinguishing low- and high-level improvement scenarios for this corridor.</p>					

For all resource topics except erosion, the maximum extent of resources in the potentially affected area for the HST Alternative alignment options is expected to be less than the potentially affected area for the Modal Alternative. For example, the number of acres of floodplains within the potentially affected area of the Modal Alternative would be 1.4 times the maximum number within the potentially affected area of the HST Alternative, and the number of linear feet of streams that would be within the potentially affected area of the Modal Alternative would be more than three times the maximum number within the potentially affected area of the HST Alternative. The only resource topic in Table 3.14-1 for which that would not apply is erosion; where figures are available, the number of acres of highly erodible soils found in the study area of the Modal Alternative would be within the range of those for the HST Alternative. However, there are proposed HST Alternative alignment options for which the amount of erodible soil areas would be less than what would be expected for the Modal Alternative. In general, the numbers presented in Table 3.14-1 suggest that most of the HST Alternative alignment options would potentially affect fewer sensitive hydrologic resources than the Modal Alternative statewide.

The analysis of representative impacts, as shown in Table 3.14-1A, indicates that overall the Modal Alternative (39,520 linear ft. (12,046 linear m) of streams, and 25 acres (10 ha) of lakes) would have more potential impacts on non-wetland water resources than the HST Alternative (22,600–32,400 linear ft (6,888–9,876 linear m) of streams and 7–27 acres (3–11 ha) of lakes).

Table 3.14-1A
Summary of Representative Hydrologic Resource and Water Quality Impacts for Alternatives

Region	Representative Impacts ³	
	Rivers/Streams ⁴ Linear Feet (Meters)	Lakes Acres (Hectares) #
Modal Alternative		
Bay Area to Merced	9,800 (2,987)	13.9 (5.6)
Sacramento to Bakersfield	16,480 (5,024)	6.3 (2.5)
Bakersfield to Los Angeles	4,280 (1,305)	3.2 (1.3)
LA - Riverside – San Diego	6,240 (1,902)	0.6 (0.2)
LA – Orange Co. - San Diego	2,720 (829)	0.7 (0.3)
Total Modal Alternative	39,520 (12,047)	25 (10.1)
High Speed Train Alternative		
Region	Representative Impacts ³	
	Rivers/Streams ⁴ Linear Feet (Meters)	Lakes Acres (Hectares) #
Bay Area to Merced	4,550-8,650 (1,387-2,637)	0.6-23.3 (0.2-9.4)
Sacramento to Bakersfield	13,350-14,500 (4,069-4,420)	4.7-12.8 (1.9-5.2)
Bakersfield to Los Angeles	3,400-5,350 (1,036-1,631)	0.3-4.6 (0.1-1.9)
Los Angeles to Irvine	NA	NA
Los Angeles to San Diego	2,150-4,650 (655-1,417)	1.5-3.5 (0.6-1.4)
Total HST Alternative	22,600-32,400 (6,889-9,876)	7-27⁵ (2.8-10.9)

³ Based on Representative Facility Footprint

⁴ Non-wetland waters excluding lakes

⁵ Total based on Business Plan System, "Highest Return on Investment Route."

All waters with impaired water quality, i.e., waters identified on the Section 303(d) CWA list distributed by SWRCB, in the potentially affected area of the Modal and HST Alternatives are identified by name in Appendix 3.14-C.

Implementation of either the Modal or HST Alternative would result in the potential for indirect impacts that are independent of location, but rather based on design characteristics. Because of design characteristics, the Modal and HST Alternatives would add different amounts of impervious surface area. The HST Alternative would consist of permeable track-fill rather than impervious pavement expansion. The quantity of impervious surface attributable to proposed HST Alternative alignments would therefore be substantially less than the estimated 4,640 total ac (1,878 ha) of pavement expansion expected under the Modal Alternative. Thus, the HST Alternative would potentially result in less runoff and would have better infiltration potential. Smaller runoff volumes under the HST Alternative would be less likely to contribute to downstream flow levels and would not increase the extent and frequency of flooding in flood-prone areas that could occur with implementation of the Modal Alternative. The HST Alternative would result in a smaller amount of added impervious surface than the Modal Alternative. As a result, the potential impacts of the HST Alternative on groundwater recharge would likely be less than the potential impacts of the Modal Alternative on groundwater recharge rates in areas where recharge is likely, such as near rivers.

Another design characteristic that differentiates the Modal and HST Alternatives involves the width of structures that would be added or improved. Whereas multiple 12-ft (4-m) lane additions for highways and new runways would be included throughout much of the study area of the Modal Alternative, the alignment width included for HST Alternative improvements would typically be 50 ft (15 m) total, and the total width would not be used completely for structure. The smaller width would accommodate fewer columns to support HST Alternative structures, which would result in less encroachment in floodplains and surface water resources. The HST Alternative would include tunnels and elevated structures designed to avoid or limit impacts that would further reduce potential impacts on hydrologic resources compared to the Modal Alternative. The HST Alternative would also allow for greater flexibility than the Modal Alternative at the design stage in addressing site-specific conditions. For example, greater flexibility in designing bridges over lagoons in the LOSSAN region would allow greater latitude to avoid potential impacts under the HST Alternative than the design of highway expansion under the Modal Alternative. The HST Alternative could be designed to span lagoons with minimal fill materials. Such options would not be available for highway expansion under the Modal Alternative because engineering options would be constrained by existing conditions and engineered fill.

3.14.4 Comparison of Alternatives by Region

The key findings of the analysis are summarized below by region and alignment options. For a complete summary of all potentially affected hydrologic resources by region, see Appendix 3.14-B.

A. BAY AREA TO MERCED

Modal Alternative

In general, the Modal Alternative would present a high potential impact on floodplains and streams in this region because it would include improvements to I-80 and I-580. Essentially, there are more corridor miles for the highway expansion under the Modal Alternative than HST corridor miles, which would result in twice the extent of potential floodplain and surface water encroachments. The Modal Alternative would cross several floodplains and streams in this region, including Suisun Creek and Sacramento River, as a result of the proposed expansion of I-80 through the Sacramento River Delta area. Potential impacts would also result from expansions of US-101 and SR-152 through the Santa Clara Valley near Gilroy, and in the Central Valley south of Merced, where there are extensive floodplains and streams, including Coyote

Creek and the Guadalupe, Pajaro, San Joaquin, and Merced Rivers. Expansion of SR-152 by two lanes would potentially affect San Luis Rey Reservoir and O'Neill Forebay.

The Modal Alternative would cross substantial groundwater resources, mostly as a result of the I-80 expansion from San Francisco to Sacramento. As there is no tunneling proposed for the Modal Alternative, these groundwater resources would be potentially impacted by short-term dewatering during construction in areas where shallow groundwater occurs, and by reduced recharge in areas paved with impervious surface over the long term.

High-Speed Train Alternative

The HST Alternative would potentially affect floodplains associated with Coyote Creek; the Guadalupe, Pajaro, San Joaquin, and Merced Rivers; and the salt ponds and sloughs within and adjacent to the National Wildlife Refuge. Potential effects to these resources might include increases in flood height in the case of the floodplains from earthen berms or linear barriers to surface flow, or encroachment within the physical structure of the salt ponds. Streams potentially affected include those associated with floodplains. Shallow groundwater at potential tunneling sites in the mountain regions (Diablo Range and Pacheco Pass) could be affected by dewatering that in turn could affect groundwater levels.

High-Speed Train Alignment Option Comparison

The San Francisco to San Jose HST alignment option would operate within the Caltrain right-of-way and would cross fewer streams than the Oakland options (Mulford Line and I-880). However, stream crossing would not be a distinguishing factor for two reasons. First, impacts would be reduced and potentially avoided to the extent feasible through the use of elevated structures over surface waters associated with the Coyote Creek river system and the many sloughs through the salt ponds in and adjacent to the National Wildlife Refuge. Second, the rivers encroached upon by the Caltrain right-of-way are channeled and highly developed. The Hayward alignment/I-880 option would have fewer potential impacts on the waters of the refuge than the Hayward/Niles/Mulford alignment. The northern tunnel Diablo Range HST alignment option from San Jose to Merced would avoid substantially more floodplains than the southern Pacheco Pass option through Gilroy, crossing an average of 159 ac (64 ha) compared to 548 ac (222 ha) of floodplains for the southern Pacheco Pass option. The Pacheco Pass route would potentially contribute to flood risk in the Pajaro River watershed, which is presently prone to flooding whereas the Diablo Range options would potentially impact the Orestimba Creek watershed. A potential increase in flood risk would be addressed by engineering design measures (e.g., elevated guideways to minimize obstructions in floodway) that would be a part of the next phase of project development, should the project advance to project-specific evaluation.

The Diablo Range direct alignment options would potentially result in the following.

- Substantially avoid both lakes and rivers, compared to the southern option through Gilroy, crossing 2700 linear ft (823 m) of rivers and 0.6 ac (0.2 ha) of lakes, compared to 6050 linear ft (1,844 m) of streams and 6 ac (2.4 ha) of lakes for the Pacheco Option.
- Cross many of the mountain streams that feed Coyote Creek and potentially contribute to the siltation of the Anderson and Coyote Reservoirs.
- Avoid more floodplains than the southern Pacheco Pass option through Gilroy, crossing an average of 159 ac (64 ha) compared to 548 ac (222 ha) for the southern Pacheco Pass option.
- Substantially avoid groundwater resources, crossing an average of 1,505 ac (609 ha) for the three northern options as opposed to an average of 2,716 ac (1,099 ha) for the three southern Pacheco Pass options.

- Avoid some potential groundwater impacts through the use of tunnels with the proposed northern alignment options in the Diablo Range between San Jose and Merced. Most of the groundwater resources in the study area are found in the Santa Clara and the Central Valleys, which would be avoided by routing the alignment through the Diablo Range.
- Cross and potentially impact the Orestimba Creek watershed (an aquatic resource of national importance).

The southern Pacheco alignment options would potentially result in the following.

- Cross mountain streams (including Carnadero, Llagas, Pacheco, and Tequisquita Creeks) tributary to the Pajaro River, which empties into Monterey Bay.
- Contribute to elevated sedimentation levels in the creeks, which could affect Monterey Bay, because of construction across the above-mentioned streams.
- East of the Diablo Mountain Range, the northern route would cross the Crow and Orestimba Creeks and the San Joaquin and Merced Rivers.
- Cross Cottonwood Creek, a tributary of the San Luis Reservoir, and Romero Creek, as well as several low-lying wetlands, ditches, and sloughs that feed the San Joaquin River. The northern route would cross Crow and Orestimba Creeks, and the San Joaquin and Merced Rivers.
- Cross more floodplains than the Diablo Range direct options that run through more of the Santa Clara and Central Valleys, both of which contain more groundwater resources than the mountains.
- Potentially contribute to flood risk in the Pajaro River watershed, which is presently prone to flooding.

B. SACRAMENTO TO BAKERSFIELD

Modal Alternative

The Modal Alternative in this region would generally involve widening SR-99 and I-5 and expanding the Sacramento Airport with six new gates. I-5 crosses a substantial amount of the Sacramento River Delta between Stockton and Sacramento, and the Sacramento airport is located near the Sacramento River, as well. As a result, the Modal Alternative would potentially encroach on more acres of floodplains region-wide than either of the HST alignment options, thus it would present greater potential for impacts on floodplains.

Direct potential impacts on canals are not expected to be substantial. Potential impacts on lakes would be expected to be similar for the various alignment options, since few Modal or HST Alternative alignments would encroach on lakes. Expansion of the I-5 corridor would result in potential erosion in the Sacramento to Stockton, Merced to Fresno, and Tulare to Bakersfield segments in an area where it would run through the mountains at the edge of the Coastal Range foothills. The Modal Alternative would result in minimal potential impacts on groundwater in this region (the mapped data does not show substantial groundwater in the study areas for modal improvements).

High-Speed Train Alternative

South of Stockton, both HST Alternative alignment options would potentially encroach on more floodplains than the Modal Alternative alignment. There is a network of canal systems in the Sacramento to Stockton corridor in the areas surrounding Modesto, Fresno, and Hanford/Visalia. The HST Alternative would cross many of these canals. Project-specific erosion potential would

not pose a problem in this region, since the slope grade through most of the Central Valley would be minimal.

As with the Modal Alternative, potential direct impacts on groundwater resources from the HST alternative would be limited to infrequent shallow groundwater occurrence where dewatering may be necessary during construction of at- and above-grade structures (e.g., support columns) and for tunneling portals. The HST Alternative, which would have permeable-surface construction, would produce smaller runoff volumes and lower potential surface contamination levels than would be expected under the Modal Alternative, which would add lanes of pavement on highways.

High-Speed Train Alignment Option Comparison

At a program level of detail, the technical analysis of these options showed slightly higher potential impacts to water resources for the UPRR alignment as compared to the CCT alignment. However, at a program level of detail, these results do not indicate a significant difference between these two HST alignment options that are 49 - 50 miles long. Also, most of the stream crossings under the UPRR alignment are canal crossings, not river crossings, and are generally smaller than the water crossings anticipated for the CCT alignment. The UPRR alignment would have 34 - 88 acres less potential impacts to floodplains than the CCT alignment.

Between Stockton and Modesto, the technical analysis of these options showed slight differences between the BNSF and UPRR alignments in regards to the potential impacts to water resources. These results do not indicate a significant difference between the two HST alignment options. The BNSF option was determined to have fewer potential impacts to lakes (8.5 acres less and streams (0 - 850 linear ft) than the UPRR alignment, but more potential impacts to floodplains (171 - 193 ac) and wetlands (2.7 - 3.0 acres) than the UP alignment.

In general, the maps show that the western HST alignment (Union Pacific Railroad [UPRR] north of Fresno, Burlington Northern Santa Fe [BNSF] south of Fresno) would potentially encroach on fewer acres of floodplains than the eastern HST Alternative alignment (BNSF north of Fresno, UPRR south of Fresno). Each of the Sacramento station options in the Sacramento to Stockton corridor occurs within the 100-year FEMA floodplain. The downtown station option has less than an acre of its footprint within this flood hazard zone and thus has a low potential for flood hazard. In contrast, the two station options at Power Inn Road along UPRR and BNSF would encroach into more floodplain area and are considered to have a medium potential for flood impacts. The inclusion of a high-speed loop around Merced would extend the HST Alternative through a large floodplain, increasing the amount of floodplains potentially affected.

Between Merced and Fresno, the technical analysis of these options showed slightly higher potential impacts to water resources for the BNSF alignment as compared to the UPRR alignment. However, at a program level of detail, these results do not indicate a significant difference between these two HST alignment options that are over 67-miles long. The BNSF option was determined to have 1.4 acres more potential impacts to wetlands, 4 more potential sensitive species, 1,050 linear feet more potential impacts to streams, and 1.3 acres more potential impacts to lakes than the UPRR alignment, but would have 10-17 acres less potential impacts to floodplains.

Between Fresno and Bakersfield, the technical analysis resulted in differences between the BNSF and UP alignments in regards to the potential impacts to water resources. However, these results do not indicate a significant difference between the BNSF and UP alignment options that vary between 106 to 111 miles in length. The BNSF option was determined to have fewer potential impacts to floodplains (22,116 - 25,227 linear ft less), streams (500 - 850 linear ft less) and lakes (0.0 - 0.3 ac less) than the UP alignment. The BNSF alignment south of Hanford

would cross more linear feet of rivers and canals than the UPRR alignment. The many canals found in this segment would make canal realignment a more costly undertaking than in other segments.

Potential impacts on lakes would be similar for the alignment options because each of the proposed alignments intersect less than 1 ac (.40 ha) of lakes. Potential groundwater impacts are not distinguishable among the alignment options because the groundwater level is deeper, and no tunneling or trenching would be included in the HST options in the region.

C. BAKERSFIELD TO LOS ANGELES

Modal Alternative

The Modal Alternative alignment would potentially affect approximately 4,280 linear ft (1,305 m) of streams in the region. Potential impacts on lakes, though considerably less of an issue region-wide, would vary by alignment within the Bakersfield to Sylmar corridor. The Modal Alternative (expansion of I-5) would potentially encroach on 3.2 ac (1.3 ha) of lakes, mostly consisting of Pyramid Lake and some of Castaic Lake. Though potential erosion would be of considerable concern within the Tehachapi corridor in the Bakersfield to Los Angeles Region, the difference in the number of acres of highly erodible soil potentially affected by the alternatives and their respective alignment options would be small, providing little distinction between the Modal and HST Alternatives based on potential for erosion.

High-Speed Train Alternative

Similar to the Modal Alternative, the HST Alternative would potentially affect about 3,400 to 5,350 linear ft (1,036 to 1,630 m) of streams. In addition, the HST Alternative would potentially encroach on Castaic Lake and Pyramid Lake.

Groundwater resources would not be an issue in the Sylmar to Burbank and Burbank to Los Angeles Union Station (LAUS) corridors because the alignment structures would be either at or above grade. The HST alignment options would affect floodplains mainly in the valleys between Bakersfield and the base of the Tehachapi Mountains.

High-Speed Train Alignment Option Comparison

The I-5 HST alignment option that includes the Union Avenue and Wheeler Ridge connections with the I-5 Tehachapi corridor would have a higher probability of affecting floodplains in the Bakersfield to Los Angeles region than either the SR-58/Soledad Canyon HST alignment option or the Modal Alternative. This is primarily because the former alignment would potentially encroach upon large areas of floodplain between Bakersfield and the bottom of the ascent over the Tehachapi's at the Grapevine. The I-5 Tehachapi corridor option would potentially affect approximately 3,050 linear ft (930 m) of streams, which is the same as the Modal Alternative, compared to the SR-58/Soledad Canyon HST alignment option, which would potentially affect 5,000 linear ft (1,524 m). The potential impact in the SR-58/Soledad Canyon HST option is due to the relatively small seasonal streams in Soledad Canyon between Palmdale and Sylmar.

The SR-58 HST alignment potentially would encroach on 1.4 ac (0.6 ha) of lakes, whereas both of the I-5 Tehachapi corridor alignment would potentially encroach on 40.6 ac (0.2 ha) of lakes, including Castaic Lake in the Castaic Valley of the Tehachapi, and Upper Van Norman Lake south of the San Fernando Pass.

Absent field verification and more detailed data collection, it is not possible at this program level of analysis to determine specifically which HST Alternative alignment option, with its respective tunneling in the Tehachapi Mountains, would potentially affect more groundwater resources.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Modal Alternative

In general, floodplains are not as extensive in the Los Angeles to San Diego region as they are in the Central Valley. The potential impact of Modal Alternative improvements in this region on floodplains would be minimal, because floodplains are highly developed and flood control is part of the existing infrastructure design, which means improvements made with the Modal Alternative would be less likely to contribute to flooding potential. The Modal Alternative would cross minor floodplains in the Temescal and Temecula Valleys.

In the Mira Mesa to San Diego segment, the Modal Alternative would raise the potential for increased runoff and sediments because it would cross more linear feet of streams than the HST Alternative, or 6,240 linear ft (1,902 m) of streams compared to an average of 2,150 to 4,650 linear ft (655 to 1,417 m) for the three HST Alternative alignment options. The Modal Alternative would potentially cross substantially more water-quality-impaired waters than the HST Alternative.

Groundwater resources would not be substantially affected by highway and airport expansion in this region. There are no segments where tunneling or trenching would be required, and shallow groundwater is not prevalent along the Modal Alternative alignment.

High-Speed Train Alternative

Similar to the Modal Alternative, the potential impact of HST Alternative alignment options in this region on floodplains would be minimal, because floodplains in this area are highly developed and flood control is part of the existing infrastructure design which the HST alignments would parallel as much as possible. Potential erosion would be a concern where the alignment options would extend to or along the coast along highly erodable slopes.

The HST Alternative would not substantially affect groundwater resources in this region. None of the segments would include tunneling or trenching, and shallow groundwater is not prevalent along the proposed HST Alternative alignment. With respect to the tunneling that is proposed in the Merriam Mountains between Temecula and Escondido, and in Escondido, little groundwater is present, and these areas would likely not require substantial dewatering during construction.

High-Speed Train Alignment Option Comparison

Though impacts on floodplains are expected to be minimal in this region, the UPRR Riverside/UPRR Colton Line alignment option without connection to San Bernardino would potentially encroach on fewer acres of floodplains than the UPRR Colton Line to San Bernardino option, or the UPRR Colton alignment option with and without San Bernardino in the Los Angeles to March ARB alignment. The South El Monte station would have potential floodplain impacts. The existing floodplain dataset would not provide a basis to distinguish between the two Escondido-traversing alignments. The two alignment options extending to the coast would present a higher potential to affect floodplains than the other HST alignment option or the Modal Alternative. The UPRR Colton Line HST alignment would potentially encroach on considerably fewer linear feet of streams than the UPRR Riverside alignment in the Los Angeles to March ARB segment. Many of these resources are already highly altered and mostly channeled, and would be little affected by the proposed HST system. The UPRR Riverside HST alignment options would potentially encroach on fewer water-quality-impaired waters than the UPRR Colton Line or the San Bernardino option or the Modal Alternative.

Three general station areas are proposed within 100 ft (30 m) of streams, which could increase the potential for contaminated runoff from parking areas entering the streams. The South El Monte station would be within 100 ft (30 m) of the San Gabriel River in South El Monte, the

Colton station would be within 100 ft (30 m) of the Santa Ana River, and the University of California, Riverside station would be within 100 ft (30 m) of Gage Canal. These rivers are mostly channelized. Unstable slopes would result in potential erosion with the two HST alignment options that extend to and run along the coast in San Diego to the downtown station stop.

Potential groundwater impacts would be similar for the proposed HST options.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Modal Alternative

The Modal Alternative would not be expected to have a substantial impact on floodplains in the region. The floodplains crossed by I-5 are highly developed, and flood control is part of the existing infrastructure. No impacts on streams or lakes have been identified in this region. Streams in the LAUS to Irvine corridor would be minimally affected because streams in this area are highly developed, and flood controls are part of the existing infrastructure design.

Widening of bridge structures, added columns, and/or increasing the embankment footprints for I-5 improvements through lagoons in San Diego County may potentially impede tidal flushing and potentially adversely affect the hydrologic conditions of the lagoons. Bridge widening would also increase the potential for impacts from stormwater runoff. Construction through these lagoons could potentially induce erosion, and potentially result in a temporary increase in the sediment load in these impaired waters. Construction of Modal Alternative improvements would potentially affect areas of intermittent shallow groundwater from dewatering during construction.

High-Speed Train Alternative

The HST Alternative would not be expected to have a substantial impact on streams or lakes in this region. Streams in the LAUS to Orange County corridor would be minimally affected because streams in this area are highly developed, and flood controls are part of the existing infrastructure.

High-Speed Train Alignment Option Comparison

The UPRR alignment option in the LAUS to Orange County corridor would cross fewer acres of floodplains than the LOSSAN alignment, but the UPRR route would involve more trenching than the LOSSAN option.

3.14.5 Design Practices

The Authority is committed to utilizing existing transportation corridors and rail lines in the proposed high-speed rail system in order to minimize potential impacts to biological resources bisecting sensitive areas and creating new crossings or encroachments on water resources. Nearly 70% percent of the preferred HST Alternative is either within or adjacent to a major existing transportation corridor (existing railroad or highway right-of-way). Use of these existing transportation corridors helps minimize potential impacts since they have already imposed a footprint/crossing along which the HST system would pass where not in a new corridor. Moreover, portions of the system would be in tunnel or on aerial structure, which would avoid and/or minimize impacts to surface water resources.

The Authority has strived to avoid water resources throughout the extensive alignment studies leading to and including this program level study. In addition, the Authority is committed to continue avoidance and minimization of potential impacts during subsequent project level analysis; however, it is unavoidable that many streams and water resources would be crossed with the proposed 800+ mile statewide HST system. Therefore, the Authority will work closely with the regulatory agencies to develop acceptable

specific design and construction standards for stream crossings, including, but not limited to, maintaining open surface (bridged versus closed culvert) crossings, infrastructure setbacks, erosion control measures, sediment controlling excavation/fill practices, and other Best Management Practices.

There is also potential for impacts to groundwater in areas of the system where tunneling or substantial excavation would be necessary. For the portions of the HST system in tunnel, geologic exploration including groundwater sampling would be completed prior to constructing the proposed tunnels. The geologic/soils/groundwater conditions would be evaluated prior to and monitored during construction to aid in the development of construction techniques and measures to minimize effects to ground- and surface water resources. Based on available geologic information and previous tunneling projects in proximity to proposed tunnels the Authority plans to fully line tunnels with impermeable material to prevent infiltration of ground- or surface waters. Infiltration of ground and surface waters into tunnels is undesirable for operations and maintenance reasons as well as the potential for adverse impacts to ground and surface waters. All reasonable measures would be taken to avoid water infiltration. In addition, it is assumed that tunnel boring machines would be appropriately equipped with shielding to minimize the infiltration of higher pressure groundwater during the boring process.

3.14.6 Mitigation Strategies and CEQA Significance Conclusions

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for hydrology and water quality, and considering the sophisticated design, engineering, and construction practices that would be used (and required in order to obtain permits), the proposed HST system alternative would have a potentially less than significant effect on hydrology and water quality when viewed on a systemwide basis. Placing the conceptual corridors for the HST system alternative within or along existing transportation corridors reduces the potential for adverse effects to these water resources, and engineering and design practices further reduce potential adverse impacts to these water resources (e.g., avoiding encroachments on water resources, use of tunnels lined with impermeable surfaces, infrastructure setbacks from surface waters, using permeable surfaces and structures to reduce flow and drainage obstructions). Additional avoidance and mitigation strategies, as well as the design practices discussed in section 3.14.5, will be applied to reduce these impacts in the second-tier, project-level analyses and in obtaining permits for facilities included in the HST system, should a decision be made to pursue its development.

Proposed general mitigation strategies would be fairly similar for all regions. These strategies are described as general policies that could be adopted and developed in detail at the project-specific level of environmental analysis. First, measures designed to avoid or limit impacts would be considered. If avoidance measures were not feasible, then mitigation measures directed at reconstruction, restoration, or replacement of the resource, in close coordination with state and federal resource agencies, would be considered as part of subsequent project planning, environmental review, and design. Potential mitigation strategies are listed below by resource.

A. FLOODPLAINS

Mitigation for potential impacts on floodplains would include consideration of the following strategies.

- As part of the future project-level analysis, floodplain hydrology/hydraulics would be analyzed to evaluate the impacts of specific designs on water surface elevations and flood conveyance and to evaluate potential flooding risk. Where feasible, avoid or minimize construction of facilities within floodplains. Where feasible, restore the floodplain, if impacted by construction, so it can again operate as before. Where no practicable alternative to avoid construction in the floodplain exists, minimize the footprint of facilities within the floodplain, e.g., by use of aerial structures or tunnels.
- As part of the future project-level analysis, all opportunities for facility redesign or modification to minimize flooding risk and potential harm to or within the floodplain would be assessed.

- Where feasible, avoid construction of facilities within floodplains; where infeasible, minimize the footprint of facilities within the floodplain.

B. SURFACE WATERS, RUNOFF, AND EROSION

Mitigation strategies for potential impacts on surface waters would include consideration of the following.

- As part of the future project-level analysis, conduct studies and evaluate potential alteration in coastal hydrology/hydraulics in tidal lagoons, bays, and marshes from specific construction methods or facility designs. Construction methods or facility designs to minimize potential impacts would be considered and used to the extent feasible.
- Permit requirements as part of project-level review would include Storm Water Pollution Prevention Plans (SWPPPs) and National Pollutant Discharge Elimination System (NPDES) permits. The SWPPP would include BMPs to minimize potential short-term increases in sediment transport caused by construction, including erosion control requirements, stormwater management, and channel dewatering for all stream and lake crossings. Regional NPDES permit requirements would be followed and BMPs, as required for new developments, would be implemented. These may include measures to provide permeable surfaces where feasible and to retain and treat stormwater onsite using catch basins and treatment (filtering) wet basins. Other measures to manage the overall amount and quality of stormwater runoff to regional systems would be detailed as part of SWPPP.
- Apply for and obtain appropriate permits under Sections 404 and 401 of CWA and comply with mitigation measures required in the permits. Other mitigation measures may include habitat restoration, reconstruction onsite, or habitat replacement offsite to compensate for loss of native habitats and wetlands. The ultimate goal of the mitigation would be to ensure minimal impact on surface water quality.
- Under the requirements of the NPDES Caltrans Statewide Storm Water Permit and the Construction General Permit, a Storm Water Pollution Prevention Plan (SWPPP) would be developed during construction and implemented to reduce pollutants in storm water discharges and the potential for erosion and sedimentation
- Implement best management practices (BMP's) which would include:
 - Practices to minimize the contact of construction materials, equipment, and maintenance supplies with storm water
 - Practices to reduce erosion of exposed soil including soil stabilization, watering for dust control, perimeter silt fences, placement of rice straw bales, and sediment basins, and
 - Practices to maintain water quality including infiltration systems, detention systems, retention systems, constructed wetland systems, filtration systems, biofiltration/bioretenion systems, grass buffer strips, ponding areas, organic mulch layers, planting soil beds, sand beds, and vegetated systems (biofilters) such as vegetated swales and grass filter strips that are designed to convey and treat either shallow flow (swales) or sheetflow (filter strips) runoff.
- Work around various surface water bodies would be required to follow Sections 401 and 404 of the Clean Water Act and applicable permit requirements.
- Follow requirements of Section 10 of the Rivers and Harbors Act if work is required around a water body designated as Navigable and applicable permit requirements.

- Work along the banks of various surface water bodies would require an application for a Lake or Streambed Alteration Agreement.
- Implement a spill prevention and emergency response plan to handle potential fuel or other spills.
- Incorporate bio-filtration swales to intercept surface runoff.
- Where feasible, avoid significant development of facilities in areas that may have substantial erosion risk, including areas with erosive soils and steep slopes.

C. GROUNDWATER

Mitigation to reduce potential impacts from construction and operation of project components on groundwater discharge or recharge would include consideration of the following strategies.

- As part of the future project-level analysis, minimize development of facilities in areas that may have substantial groundwater discharge or affect recharge.
- Apply for and obtain waste discharge requirements, where needed (e.g., for de-watering), as part of project-level review.
- As part of the future project-level analysis, develop facility designs that are elevated, or at a minimum are permeable, and would not affect recharge potential where construction is required in areas of potentially substantial groundwater discharge or recharge.
- Apply for and obtain a SWPPP under NPDES permit requirements for grading, and describe BMPs that would control release of contaminants near areas of surface water or groundwater recharge (include constraining fueling and other sensitive activities to alternative locations, providing drip pans under some equipment, and providing daily checks of vehicle condition).
- Include consideration of use and retention of native materials with high infiltration potential at the ground surface in areas that are critical to infiltration for groundwater recharge.

The above mitigation strategies, which include further study leading to refinement of site-specific mitigation measures and Best Management Practices, are expected to substantially lessen or avoid impacts to hydrology and water quality. At the second-tier, project-level review, applications of these mitigation strategies are expected to reduce impacts to hydrology and water quality to a less-than-significant level. Additional environmental assessment will allow more precise evaluation in the second-tier, project-level environmental analyses.

3.14.7 Subsequent Analysis

Subsequent analysis to further identify potential impacts on water quality and hydrologic resources would be required as project development, environmental review, and facility design are pursued, if a decision is made to go forward with the proposed HST system. This subsequent analysis may include the following.

- Further analysis and assessment of potential facility impacts on floodplains, specifically on flood elevations, as specific locations and facility designs are developed to determine if the proposed facility is in the base floodplain (that area which has a 1% or greater chance of flooding in any given year). The analysis would identify potential encroachment on study-area floodplains as defined in Executive Order 11998 for Floodplain Management (23 C.F.R. § 650[a]) and DOT Order 5650.2, or location of facilities in a 100-year floodplain without adequate mitigation measures.

- Further analysis (hydrologic modeling of flow rates) of potential construction and facility impacts on surface hydrology in coastal areas and tidal marshes and lagoons, and on other surface waters.
- Analysis of potential construction and facility impacts on surface hydrology in areas that are characterized as wetlands and that were not included in this analysis because field verification and wetland delineation was not part of this program-level evaluation. (See Section 3.15, *Biological Resources and Wetlands*, for discussion of wetlands.)
- Field surveys of potential surface water impacts to further analyze potential impacts on water quality and to seek required permits from the appropriate agencies.
- Identification of potentially substantial alteration in water-flow and drainage patterns, including increased storm water runoff, or increased groundwater discharge or reduction of groundwater recharge.
- Evaluation of potential impacts of the alternatives on groundwater recharge and infiltration systems.
- Identification and study of areas of shallow groundwater to determine possible dewatering impacts resulting from construction.
- Analysis of how the different alignment options would contribute to total additional impervious surface and the subsequent potential additional impacts on surface runoff. This analysis would also identify potential mitigation measures, including onsite retention facilities.
- Field geotechnical studies to evaluate the potential for erosion and associated risks.
- Field surveys of groundwater discharge or recharge conditions. Additional supplemental analysis of groundwater conditions with information from other geotechnical studies.

3.15 BIOLOGICAL RESOURCES AND WETLANDS

This analysis reviews the biological resources and wetlands that may in the future require a permit and Section 404(b)(1) analysis under the federal Clean Water Act (CWA) for a proposed action, and includes sensitive plant communities and special-status species, marine and anadromous fish habitat, riparian corridors, wildlife habitats, wildlife movement corridors, wetlands, and waters. Appendix 3.15-A provides a general description of the biological resource topics. This section describes the existing biological resources and wetlands within the five project regions, and identifies the areas of potential impacts for each of the alternatives and for the high-speed train (HST) alignment and station options for these resources.

3.15.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

This section briefly identifies the key federal and state laws and regulations relative to biological resources. Descriptions of these laws and regulations are provided in Appendix 3.15-B.

Federal Laws and Regulations

- federal Endangered Species Act (ESA) (16 U.S.C. 1531–1543).
- CWA (33 U.S.C. 1251–1376).
- Section 10 of the Rivers and Harbors Act (33 U.S.C. 401 et seq.).
- Fish and Wildlife Coordination Act (16 U.S.C. 661–666).
- Coastal Zone Management Act (16 U.S.C. 1456).
- Executive Order 11990, Protection of Wetlands (May 24, 1977), DOT Order 5660.1A.
- Executive Order 13112, Invasive Species (February 3, 1999).

State Laws and Regulations

- California Endangered Species Act (CESA) (Fish and Game Code 2050 *et seq.*).
- Native Plant Protection Act (Fish and Game Code § 1900–1913).
- Natural Community Conservation Planning Act (Fish and Game Code Section 2800 *et seq.*).
- Streambed Alterations (Fish and Game Code § 1601–1603).
- California Coastal Act (Public Resources Code § 30000, *et seq.*).

B. METHOD OF EVALUATION OF IMPACTS

Data Collection and Geographic Information System Mapping

The proposed Modal and HST Alternatives would cross a variety of biotic communities and could potentially result in impacts on many plant and wildlife species, and many water resources. Plant taxonomy and nomenclature follows Abrams (1923, 1944, 1951), Abrams and Ferris (1960), Buckingham et al. (1995), Hickman (1993), and Hitchcock et al. (1996). Scientific nomenclature and common names for butterflies follows Miller (1992); fish, Robins et al. (1991); herpetofauna (amphibians and reptiles), Committee on Standard English and Scientific Names (2001); birds, American Ornithologists' Union (1983, 1998); and mammals, Wilson and Cole (2000).

Geospatial data based on the California Gap Analysis Program (GAP) (Davis 1998), which uses the Wildlife Habitat Relationship (WHR) classification (Ziener et al. 1988; 1990a; 1990b), was

used as the primary source for delineation of vegetation communities along the HST and Modal Alternatives. However, the classification is based on Holland (1986). The most recent vegetation classification for California (Swayer and Keeler-Wolf 1995) was not used, as this data is not available in geospatial contexts. Geospatial data for threatened and endangered species and special-status species was obtained from the California Natural Diversity Data Base (CNDDB) (California Department of Fish and Game 2002). Information on wildlife movement corridors was obtained from the *Missing Linkages* report prepared by the California Wilderness Coalition (2000).

The type and extent of jurisdictional wetlands within the study areas came from the National Wetland Inventory (NWI) maintained by the U.S. Fish and Wildlife Service (USFWS) to provide information on the characteristics, extent, and status of the nation's wetlands and deepwater habitats. NWI digital data files are records of wetlands location and classification as developed by the USFWS. The federal Geographic Data Committee adopted this classification system as a national classification standard in 1996. The location of the wetlands is mapped on U.S. Geologic Survey (USGS) 7.5-minute topographic quadrangle maps with codes that provide information on the water body type and substrate. The NWI maps do not show all wetlands since the maps are derived from aerial photo interpretation with varying limitations due to scale, photo quality, inventory techniques, and other factors. Consequently, the maps tend to show wetlands that are readily photo-interpreted given consideration of photo and map scale. This level of information, though incomplete for some areas, provides a general overview of areas with potential sensitivity for wetland impacts that is used in the comparison of alternatives and the identification of areas where subsequent field work and wetland delineation would be conducted in the next phase of environmental evaluation, should HST be carried forward for further analysis. Wetland information, where previously mapped, is quantified to estimate the approximate acres potentially affected by the alternatives.

In addition, the Authority pursued further research regarding additional sources of information on wetland and water resources as a response to comments. The research included over 12 agency and organizational data sources. Most of the data sources were based on or included the same information as the NWI and USGS databases. One exception was the California Spatial Information Library's Hydrographic database, which included a more comprehensive coverage of water resources than our previous sources. However, the additional information was still only a marginal increment over the USGS database.

In terms of information on wetlands resources, the co-lead agencies acknowledge the areas of the NWI where wetland resources have yet to be mapped; however, extensive attempts to obtain information in these areas has resulted in very little additional data. In these areas of limited or no wetlands information, the co-lead agencies have determined that water resources are the best indicator of the presence of wetlands for this program level analysis. Comprehensive and complete information exists for the water resources and is readily compared in the Program EIR/EIS for each alignment option to determine those that have the least potential for impacting water resources. Subsequent project level studies will provide field surveys in all areas of potential impact along the alignment options carried forward.

Digitized information for vernal pools was obtained from the California Department of Fish and Game (CDFG) and included USFWS Holland vernal pools coverage with density classes and supporting metadata file; Northern San Joaquin Valley vernal pool complexes identified by California State University, Chico; and a vernal pool species layer showing critical habitat for a suite of vernal pool species.

There were no geospatial data available for riparian corridors. The presence of streams and corresponding riparian vegetation was developed using USGS quadrangle maps, and geospatial results of the California GAP and CNDDB for specific riparian vegetation polygons.

Geographic information systems (GIS) data was exported to excel spreadsheets to show acreages of attributes for each alternative and alignment option.

A detailed description of the data collection methods is provided in Appendix 3.15-C. No field or onsite visits were made for this Program EIR/EIS. GIS files of highway, rail, and airport improvements were digitally overlaid on top of the datasets of biological resources and wetlands to identify locations where the study areas around potential alignments for proposed alternatives might include portions of sensitive biological areas. The study area was defined to encompass both direct and indirect construction-related and operational impacts.

The areas of overlap—wherever the study area included a sensitive vegetation community or habitat—were considered to constitute areas of potential impacts from the proposed alternatives. The number of reported occurrences of a particular biological resource within the study area, the linear contact of the study area with the biological resource, and acreage of the resource within the study area were counted and compiled. These results were processed into a series of frequency distributions that allowed an estimate of high, medium, or low for a potential impact.

There are inevitable inaccuracies and gaps in the statewide and federal datasets and vegetation data layers due to differences in collection methods, dates the data was first collected, changes in habitat conditions, and myriad other factors. For the scale of analysis for this Program EIR/EIS, these available data sources are considered appropriate to identify key differences between proposed alternatives and potential alignment options. Given the datasets, the lack of identification of an impact does not necessarily mean that this portion of the proposed alternative would not result in potential impacts on biological resources, only that location-specific data would be required to make a more precise determination. Likewise, the identification of a potential impact on a specific resource is intended to be conservative and in some instances may be an overstatement, because neither habitat that is sensitive nor species of concern may be found in or near the footprint of the proposed corridor or actual alignment. Verification of potential impacts would require future location-specific study and evaluation to determine the level and extent of potential impact. This level of analysis would be part of a subsequent stage of environmental review.

C. SIGNIFICANCE CRITERIA FOR BIOLOGICAL RESOURCES

The significance criteria for identifying potential impacts on biological resources from proposed projects/actions are based on federal and state guidelines and general indicators of significance, including guidelines or criteria in NEPA, CEQA, CWA, CESA, ESA, and California Fish and Game Code. Project-specific criteria would be applied at the project level of environmental analysis when permits are being sought, if a decision is made to proceed with a proposed HST following this program-level analysis.

Based on the presence or absence of sensitive resources, an alternative may have a considerable impact on biological resources if its implementation would result in any of the following.

- Potential modification or destruction of habitat, movement/migration corridors, or breeding areas of endangered, threatened, rare, or other species as described above.
- Potential loss of a substantial number of any species that could affect the abundance or diversity of that species beyond the level of normal variability.
- Potential impacts on or measurable degradation of protected habitats; sensitive natural vegetation communities; wetlands; or other habitat areas' plans, policies, or regulations.

- Potential conflict with the provisions of an adopted habitat conservation plan (HCP), natural community conservation plan¹ (NCCP), or other approved local, regional, or state habitat conservation plan.
- Potential conflict with local ordinances protecting biological resources, such as a tree or creek preservation policy or ordinance.

3.15.2 Affected Environment

A. STUDY AREA DEFINED

The biological resources study area representing the potentially affected environment for the analysis of alternatives, including the various alignments and station options, is defined by the following limits, unless otherwise noted.

- 1,000 ft (305 m) on either side of alignment centerlines and around stations in urbanized areas.
- 0.25 mi (0.40 km) on either side of alignment centerlines and around stations in undeveloped areas.
- 0.50 mi (0.81 km) on either side of alignment centerlines and around stations in sensitive areas.

To provide a larger context to the affected environment and to account for potential indirect impacts on biological resources that could result from project-related noise, light, or shadows, as well as other disruption to or physical separation of habitat areas, the biological resources study area is larger than the footprint of either the Modal or HST Alternative, which would be between 50 ft (15 m) and 100 ft (30 m). The largest study area in sensitive habitat (0.50 mi [0.81 km] either side of the centerline, or a 1-mi-wide [1.6-km-wide] corridor), is used to capture potential indirect impacts on migrating birds and other wildlife that use these areas for nesting or foraging for food. At this program level of analysis, this approach provides opportunities to focus on broad areas of potential impact where field studies would be conducted to help direct where alignment or project profile changes could be made during the subsequent phase of project design to avoid or minimize impacts on sensitive resources (habitat area). The smallest study area (1,000 ft [305 m] on either side of an alignment centerline) applies to alignments/corridors in urbanized areas where biological resources are limited to localized instances (creek crossings, urban parks, and open space). The 0.25-mi [0.40-km] area was used to encompass natural undisturbed resources that could be subject to indirect impacts from noise, erosion, storm water runoff, or other effects of construction or operation of the alternatives.

To represent the potential for direct impact to water and biological resources for the System Alternatives (Modal and HST), a GIS analysis was completed for the approximate footprint of the alternative facilities. For the HST Alternative, this analysis identified and quantified potential direct impacts based on the representative Draft Program EIR/EIS alignments within the broader GIS envelopes used to identify the potentially affected resources. For the Modal Alternative, this analysis identified and quantified potential direct impacts for the highway improvements only. The quantifications are representative of the unmitigated potential for direct impacts that could occur within the corridor. Subsequent project level engineering and environmental studies would focus on avoidance and minimization of potential impacts.

This analysis of representative impacts focused on the following biological resources: wetlands (area), special status species (#), and special status species habitat (area).

¹ The NCCP program of CDFG is an effort by the State of California and many private and public partners that takes a broad-based ecosystem approach to planning for the protection and perpetuation of biological diversity. An NCCP identifies and provides for the regional or area-wide protection of plants, animals, and their habitats, while allowing compatible and appropriate economic activity. CDFG and USFWS provide the necessary support, direction, and guidance to NCCP participants in these functions.

The affected environment study area varied by region based on the technical analysts' judgment of the sensitivity of the biological resources in the region, and in some cases to allow for future flexibility with alignment plans where the proposed alignment is not in an existing rail or highway right-of-way. The study area used for each of the five regions is described below.

Bay Area to Merced

On the Bay side of the alignments along San Francisco Bay, the 1,000-ft (305-m) study area width was reduced to 100 ft (30 m) because local, state, and federal agencies (including the San Francisco Bay Conservation and Development Commission, State Lands Commission, and U.S. Army Corps of Engineers [USACE]) would generally not permit or would severely restrict additional fill in the Bay. Away from the Bay side, the study area was 1,000 ft (305 m) on either side of the centerline of highway and rail corridors (i.e., a corridor totaling 2,000 ft, or 710 m).

Sacramento to Bakersfield

The study area in this region was 1,000 ft (305 m) on either side of alignment/corridor centerlines, around stations, and in developed areas, and 0.25 mi (0.40 km) on either side of the centerline in undeveloped areas. The smaller study area was used where alignments were within or parallel to existing rail or highway transportation right-of-way.

Bakersfield to Los Angeles

The study area in this region was 0.5 mi (0.8 km) on either side of highway and rail corridors and around stations. The broader study area was used in this region primarily because of the Tehachapi mountain crossings in undeveloped areas.

Los Angeles to San Diego via Inland Empire

In this region, the study area was 1,000 ft (305 m) on both sides of Modal and HST alignments/corridors in developed areas, and 0.25 mi (0.40 km) around stations and on both sides of corridors in undeveloped areas.

Los Angeles to San Diego via Orange County

Other than the undeveloped area of Camp Pendleton and several other small open areas, most of the study area in this region is designated by Census data as urbanized. Thus, most of the analysis used 1,000 ft (305 m) on either side of the centerline, or a corridor totaling 2,000 ft (710 m). Because of the sensitive nature of the six lagoons, the surrounding study areas were 1.0-mi (1.6-km) wide. In addition, all undeveloped areas within this region are considered sensitive; therefore, the study area was either 0.50 mi (0.8 km) or 1.0 mi (1.6 km) on either side of the centerline.

The analysis area for the representative impact area was consistently applied throughout the system as follows:

- HST
 - 0' in tunnels
 - 50' total width in aerial and at-grade
- Modal
 - 20' on each side of existing highway facility (40' total width) for 1 new lane/direction
 - 40' on each side of existing facility (80' total width) for 2 new lanes/direction

B. GENERAL DISCUSSION OF BIOLOGICAL RESOURCES AND WETLANDS

Following is a brief description of the resource topics reviewed in this section. A more detailed description of these resources and the sources of information used to obtain the descriptions are provided in Appendix 3.15-A. In addition, this section discusses HCPs, critical habitat² areas, and other conservation plans or areas that could potentially be affected by one or more of the alternatives discussed in this document.

Sensitive Vegetation Communities

Sensitive vegetation communities are natural communities (assemblages of species, both plant and wildlife, forming communities) and wildlife habitats that are unique, of relatively limited distribution in the region, or of particularly high wildlife value. These resources have been defined by federal, state, and local government conservation programs.

Sensitive Plant Species

Sensitive plant species include plant species that have been afforded special status and/or recognition by federal and state resource agencies, as well as private conservation organizations, because of documented or perceived decline or limitation of population size or geographical extent.

Sensitive Wildlife Species

Sensitive wildlife species include wildlife species that have been afforded special status and/or recognition by federal and state resource agencies, as well as private conservation organizations, because of documented or perceived decline or limitation of population size or geographical extent. Special-status species include wildlife, fish, or animals that are legally protected, or that are otherwise considered sensitive by federal, state, or local resource conservation agencies and organizations. Special-status species include species listed as state and/or federal threatened or endangered species under ESA or CESA, those considered as candidates for listing, and species identified by USFWS and/or CDFG as California species of special concern.

Wildlife Movement/Migration Corridors

Wildlife movement/migration corridors link together areas of wildlife habitat that are otherwise separated by rugged terrain, changes in vegetation, or human disturbance. The fragmentation of open space areas by urbanization tends to create isolated islands of wildlife habitat.

Water Resources

Lakes, rivers, streams, and other water bodies are protected by federal and/or state law. Special aquatic sites, which include wetlands, are considered an important subset of these waters. Wetlands and certain other waters would be delineated as part of a subsequent environmental review process.

C. BIOLOGICAL RESOURCES AND WETLANDS BY REGION

Following is a brief discussion of resources within each of the five regions for the topics described above.

Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley. The area traversed by the alternatives is dominated by three principle geophysical features: the

² Critical habitat refers to areas shown on maps developed by USFWS that provide habitat for threatened and endangered species.

San Francisco Bay and coastal valleys, including the Santa Clara Valley and the Bolsa; the Diablo Range; and the Central Valley. The three major watersheds that correspond to the three principle geophysical features are the San Francisco Bay watershed, Pajaro River watershed, and San Joaquin River watershed. Elevation along the proposed HST alignment options in this region ranges from sea level to nearly 5,000 ft (1,524 m).

Vegetation communities generally found along the proposed HST alignment options from the Bay Area to Merced are varied. Major biological communities include blue oaks (*Quercus Douglasii*) and/or foothill pine (*Pinus sabiniana*) woodlands; chaparrals (*Adenostoma fasciculatum*) and montane hardwoods (*Cercocarpus betuloides*); chenopod scrubs, including alkali desert scrub; coastal oak woodlands-scrub oak (*Quercus berberidifolia*); interior live oak (*Quercus wislizenii*); coast live oak (*Quercus agrifolia*); valley oak (*Quercus lobata*); coastal salt marsh (northern coastal type); coastal scrubs (Diablan coastal scrub); freshwater marsh, including emergent wetland and cismontane alkali marsh; nonnative grasslands, including annual grassland and valley and foothill grassland; riparian woodlands; and valley oak woodland.

The 28,000-acre (ac) (11,331-hectare [ha]) Don Edwards San Francisco Bay National Wildlife Refuge, which is located in the region on the southeast side of the San Francisco Bay, is the largest urban wildlife refuge in the nation. It is home to millions of shorebirds and waterfowl, with a total of 250 bird species, including the endangered California clapper rail (*Rallus longirostris obsoletus*). Another special-status species in the refuge is the salt marsh harvest mouse (*Reithrodontomys raviventris*). The Mount Hamilton Project of The Nature Conservancy encompasses a 1,560-sq-mi (2,511-sq-km) area in this region that extends from south of the Pacheco Pass to north of the Altamont Pass, with large parts of the area protected by conservation easements. The South Bay Salt Pond Restoration Project, a 25-sq-mi (65-sq-km) project to restore the wetlands from the San Mateo Bridge to the southern edge of the Bay, was initiated by the California Coastal Conservancy, USFWS, and CDFG in 2003. The Henry Coe State Park located northeast of Gilroy is a 79,149-ac (32,031-ha) park and a 23,300-ac (9,429-ha) wilderness area (Orestimba Wilderness Area) that is home to a variety of special-status species and wildlife, including an estimated 675 vascular plants.

The Grassland Ecological Area (GEA), which is located north, east, and south of the city of Los Banos in Merced County, encompasses approximately 180,000 acres and is the largest wetland complex in California and contains the largest block of contiguous wetlands remaining in the Central Valley.³ This region is considered a critical component of the Central Valley wintering habitat for waterfowl and has been recognized as a resource of international significance.

Sensitive Vegetation Communities: The natural communities of special concern in this region are central coast cottonwood-sycamore riparian forest, cismontane alkali marsh, northern coastal salt marsh, northern hardpan vernal pool, serpentine bunchgrass, sycamore alluvial woodland, valley oak woodland, and valley sink scrub. The Mount Hamilton Project area contains valley oak savanna and blue oak woodlands, and supports diverse animal life.

When cross-referenced with the Wildlife Habitat Relationships System,⁴ sensitive vegetation communities were identified along the project alignment options from the California GAP GIS database, including alkali desert scrub (also known as chenopod scrubs), freshwater emergent wetland, lacustrine habitat, valley oak woodland, and valley-foothill riparian woodland.

³ Grasslands Water District, Land Use and Economics Study: Grasslands Ecological Area (July 2001), P. 2 (hereafter "Grassland Water District").

⁴ The Wildlife Habitat Relationship (WHR) was developed by CDFG and is used as a classification system (Zeiner *et al.* 1988, 1990a, 1990b).

Sensitive Plant Species: Nearly 70 special-status plant species have the potential to occur in this region, including those indigenous to vernal pools, chenopod scrubs, cismontane woodlands, coastal salt marsh, and serpentine substrates. Examples include large-flowered fiddleneck (*Amsinckia grandiflora*), succulent owl's clover (*Castilleja campestris* ssp. *Succulenta*), palmate-bracted bird's beak (*Cordylanthus palmatus*), and Boggs Lake hedge-hyssop (*Gratiola heterosepala*). A complete listing of sensitive plant species in this region is included as part of the biological resources technical evaluation for the Bay Area to Merced region.

Sensitive Wildlife Species: More than 98 special-status wildlife species have the potential to occur in this region, including more than 20 special-status invertebrate species, six special-status fish species, 12 special-status reptiles and amphibians, more than 40 special-status bird species, and more than 20 special-status mammal species. These species include several fairy shrimp; vernal pool fairy shrimp (*Branchinecta lynchi*); three species of steelhead: Central Valley, Central California coast, and South Central California (*Oncorhynchus mykiss*); Sacramento splittail (*Pogonichthys macrolepidotus*); California tiger salamander (*Ambystoma californiense*); California red-legged frog (*Rana aurora daytonii*); blunt-nosed leopard lizard (*Gambelia silus*); Alameda whipsnake (*Masticophis lateralis euryxanthus*); giant garter snake (*Thamnophis gigas*); San Francisco garter snake (*Thamnophis sirtalis tetrataenia*); California brown pelican (*Pelecanus occidentalis californicus*); American peregrine falcon (*Falso peregrinus anatum*); California black rail (*Laterallus jamaicensis coturniculus*); California clapper rail (*Rallus longirostris obsoletus*); least Bell's vireo (*Vireo bellii pursillus*); salt marsh harvest mouse (*Reithrodontomys raviventris*); and San Joaquin kit fox (*Vulpes macrotis mutica*). In addition, southwestern pond turtle (*Clemmys marmorata pallidus*) and western burrowing owl (*Athene cunicularia hypugaea*) have the potential to occur in the Mount Hamilton Project area.

Wildlife Movement/Migration Corridors: While there are limited data available on wildlife movement/migration corridors in this region, all of the major riparian and stream corridors of the canyons of the Diablo Range provide corridors for wildlife movement. In addition, many streams and major rivers of the region are fish migration corridors used by anadromous and freshwater species. Further, on the west side of the Central Valley, the relatively extensive strip about 10-mi (16-km) wide of annual (nonnative) grassland that lies between the irrigated fields and orchards of the valley floor and the oak and pine woodlands of the Diablo Range provides a movement corridor for the San Joaquin kit fox (*Vulpes macrotis muticsa*).

Water Resources: In the Bay Area to Merced region, wetlands and water resources include most of the major ecological types found in California (i.e., bays, rivers, streams, lakes, ponds, springs, seeps, and marshes). Following the ecologically based Cowardin system of wetland classification, the main types of wetlands along the alignments of the proposed alternatives in this region include estuarine, lacustrine, palustrine, and riverine systems. Vernal pools may be present, specifically on Clear Lake soils fringing San Francisco Bay, or on Central Valley terrace deposits (see Figure 3.15-1).

CDFG's habitat-based California Wildlife Habitat Relationships system catalogues both freshwater emergent wetland and lacustrine wetland types. Following the floristically based Holland system of classification, the major wetland types in the study area for this region are cismontane alkali marsh, freshwater emergent marsh, northern coastal salt marsh, and northern hardpan vernal pool.

Conservation Plans: A restoration plan is being developed by the California Coastal Conservancy, USFWS, and CDFG for the Cargill salt properties (South Bay Salt Pond Restoration Project) to restore salt marshes, as well as to provide public access and public recreation. Critical habitat may be proposed for the tiger salamander, which USFWS has recently proposed for listing and whose habitat areas include the western foothills of the Central Valley, through the Diablo Range

crossing to Gilroy. The Nature Conservancy is pursuing conservation measures to protect more than 780 square mi (2,020 square km) of land in the Diablo Range to safeguard native species and natural habitats. This project was started in 1998 with the largest single private conservation project in northern California history—involving two ranches east of Mount Hamilton totaling 61,000 ac (24,686 ha). The Nature Conservancy's goal is to protect some 200,000 ac (80,937 ha) by 2007. This area would protect the San Joaquin kit fox, the California red-legged frog, valley oak savannas, blue oak woodlands, and native fish and amphibians.

Sacramento to Bakersfield

Regional Summary: This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield. The study area for the Sacramento to Bakersfield region crosses many different ecosystems: native and introduced plant communities; permanent and seasonal streams and rivers with associated riparian communities; and seasonal wetlands, vernal pools, and other waters. In addition, biological communities are found in lands in agricultural use, including row crops, nut orchards, vineyards, and other cultivated lands.

Between Sacramento and Bakersfield, the Central Valley crosses a relatively flat plain that historically supported lush stands of riparian vegetation, extensive wetlands, and a plethora of wildlife. Since colonization by European settlers, river channeling and flood control efforts, and the introduction of agriculture have changed this plain dramatically. Today this portion of the Central Valley supports a multitude of agricultural activities and is home to many people. This has resulted in the removal of native vegetation communities, the draining of wetlands, and a reduction in wildlife distribution and abundance. While urbanization and agriculture have reduced the abundance of native habitats, habitat areas still exist, often supporting sensitive plants and animals. Vegetation data for the study area in the region indicate that 13 vegetation communities can be found in the Central Valley between Sacramento and Bakersfield. (Lake and river categories are not included in this total.) The largest area, more than 185,000 ac (74,867 ha), is covered by agricultural lands; the smallest area, approximately 10 ac (4 ha), is covered by blue oak woodland.

More than two dozen major rivers flow within the study area in this region, generally heading from east to west, including the Consumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, Fresno, San Joaquin, Kings, Kaweah, Tule, and Kern Rivers.

Sensitive Vegetation Communities: There are five types of sensitive vegetation communities found in this region: Central Valley cottonwood riparian forest, Central Valley oak riparian forest, northern hardpan vernal pool, northern claypan vernal pool, and valley sink scrub.

Sensitive Plant Species: There is potential for 29 sensitive plant species to occur in the region based on a review of the CNDDDB prepared by CDFG. Twenty-eight are federally and state-listed species, and one is a California Native Plant Society (CNPS) List 1B species.⁵ Among the sensitive plant species in this region are Ferris's milkvetch (*Astragalus tener* var. *ferrisiae*), alkali milkvetch (*Astragalus tener* var. *tener*), Heartscale (*Atriplex cordulata*), brittlescale (*Atriplex depressa*), San Joaquin saltbush (*Atriplex joaquiniana*), Bakersfield smallscale (*Atriplex tularenses*), subtle orache (*Atriplex subtilis*), lost hills crownscale (*Atriplex vallicola*), big tarplant (*Blepharizonia plumose* ssp. *Plumose*), California jewelflower (*Caulanthus californicus*), slough thistle (*Cirsium crassicaule*), Mt Hamilton thistle (*Cirsium frontinale* var. *campylon*), hispid bird's beak (*Cordylanthus mollis* ssp. *Hispidus*), recurved larkspur (*Delphinium recurvatum*), Bogg's Lake hedge-hyssop (*Gratiola heterosepala*), Coulter's goldfields (*Lasthenia glabrata* ssp. *Coulter*),

⁵ CNPS listing considered rare or endangered in California and elsewhere in their range, or extinct in California, 2001.

Comanche Point Layia (*Layia leucopappa*), Munz's tidy tips (*Layia munzii*), legenere (*Legenere limosa*), Madera Linanthus (*Linanthus serrulatus*), Merced Monardella (*Monardella leucocephala*), San Joaquin Wollythreads (*Monolopia congdonii*), Bakersfield cactus (*Optunia basilaris* var. *treleasei*), San Joaquin Valley Orcutt grass (*Orcuttia inaequalis*), hairy orcutt grass (*Orcuttia pilosa*), Merced Phacelia (*Phacelia ciliata* var. *opaca*), San Joaquin Adobe Sunburst (*Pseudobahia peirsonii*), Sanford's Arrowhead (*Sagittaria sanfordii*), Creene's tuctoria (*Tuctoria greenei*).

Sensitive Wildlife Species: More than 14 special-status wildlife species have the potential to occur in the study area in this region based on the general types of habitat present. These include vernal pool fairy shrimp (*Branchinecta lynchi*); valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*); vernal pool tadpole shrimp (*Lepidurus packardii*); Sacramento splittail (*Pogonichthys macrolepidotus*); four runs of chinook salmon (*Oncorhynchus tshawytscha*), divided into three different Evolutionarily Significant Units, or ESUs; steelhead (*Oncorhynchus mykiss*); California tiger salamander (*Ambystoma californiense*); blunt-nosed leopard lizard (*Gambelia sila*); giant garter snake (*Thamnophis gigas*); Swainson's hawk (*Buteo swainsoni*); bank swallows (*Riparia riparia*); Fresno kangaroo rat (*Dipodomys nitratoideis exilis*); Tipton kangaroo rat (*Dipodomys nitratoideis nitratoideis*); and San Joaquin kit fox (*Vulpes macrotis mutica*).

Wildlife Movement/Migration Corridors: There is little available data on wildlife movement corridors within the study area in this region. Intensive agricultural activities have reduced the available native habitats. Existing infrastructure, such as roads, rail lines, and aqueducts, has fragmented habitat and reduced migration corridors. The San Joaquin kit fox has been known to inhabit areas on the San Joaquin Valley floor in Kern, Tulare, Kings, Fresno, Madera, San Benito, Merced, Stanislaus, and San Joaquin Counties, and in the surrounding foothills of the Coastal Ranges.

Water Resources: The Sacramento to Bakersfield region contains wetlands and other water bodies, including lakes and open water systems, aquatic beds, emergent wetlands, scrub wetlands, unvegetated wetlands, tidal waters, rivers, perennial streams, intermittent streams, and vernal pools.

Conservation Plans: The alternatives and HST alignment options between Sacramento and Bakersfield would cross through several HCP and NCCP planning areas, including the eastern Merced County NCCP/HCP and the Kern Valley Floor multi-species HCP. The Kern County Valley Floor HCP, which is in draft form, will cover 3,110 sq mi (5,005 sq km), located 20 mi (32 km) west of Bakersfield. It will include all of Kern County below 200 ft (61 m) elevation and on the valley floor. The plan is proposed to address eight species, including Bakersfield cactus, blunt-nosed leopard lizard, San Joaquin kit fox, and Tipton kangaroo rat. 36 NCCP/HCPs are reported within the San Joaquin Bioregion.

Bakersfield to Los Angeles

Regional Summary: This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles. The widely varying topography of this region comprises mountainous regions with steep ridges, valleys, and flat plains. The northwestern portion of the study area in this region is located in the San Joaquin Valley, a valley characterized by a flat plain that extends east to the Tejon Mountains, which run approximately north to south. The plain extends south and the elevation abruptly rises into the San Gabriel Mountains, which run west to east, in the central portion of the study area. The San Gabriel Mountains gradually decline into the flat Los Angeles basin in the southern portion of the study area. Between the Tehachapi Mountains and the San Gabriel Mountains in the eastern portion of the study area is the Antelope Valley, a valley

characterized by a flat plain dotted with isolated peaks. The City of Tehachapi is located in a flat valley between the Tejon Mountains and the Tehachapi Mountains, which also run north to south. The study area in this region ranges in elevation from 250 ft (76 m) to 5,600 ft (1,707 m).

Major watercourses are located throughout the study area in this region. Pyramid Lake and Castic Lake are located in the west along I-5. Lake Palmdale and Una Lake are located in the east near Sierra Highway. The Santa Clara River traverses the south-central portion of the study area through Soledad Canyon. The Los Angeles River winds through the City of Los Angeles in the southernmost part of the study area.

There are 14 major vegetation communities in the study area in this region: urban/developed, agriculture, chaparral, coastal sage scrub, oak woodland and forest, valley grassland, creosote scrub brush, desert saltbush scrub, foothill pine-oak woodland, montane coniferous forest, piñon-juniper woodland, riparian woodland, freshwater marsh, and Mojave mixed woody scrub.

Sensitive Vegetation Communities: Sensitive vegetation communities found in this region include California walnut woodland, mainland cherry forest, riversidean alluvial fan sage scrub, southern coast live oak riparian forest, southern cottonwood-willow riparian forest, southern riparian scrub, southern sycamore-alder riparian woodland, southern willow scrub, stabilized interior dunes, valley needlegrass grassland, valley oak woodland, valley saltbush scrub, and wildflower fields.

Sensitive Plant Species: A total of 29 CNPS List 1B plants and 14 federally and state-listed species have the potential to occur in the study area in this region. Specific species include Mt. Pinos onion (*Allium howellii* var. *clokeyi*), San Gabriel manzanita (*Arctostaphylos gabrielensis*), Kusche's sandwort (*Arenaria macradenia* var. *kuschei*), Greata's aster (*Aster greatae*), Braunton's milk-vetch (*Astragalus brauntonii*), Lancaster milk-vetch (*Astragalus preussii* var. *laxiflorus*), Parish's brittlescale (*Atriplex parishii*), Davidson's saltscale (*Atriplex serenana* var. *davidsonii*), Bakersfield smallscale (*Atriplex tularensis*), Nevin's barberry (*Berberis nevinii*), Palmer's mariposa lily (*Calochortus palmeri* var. *palmeri*), Plummer's mariposa lily (*Calochortus plummerae*), Alkali mariposa lily (*Calochortus striatus*), Mt. Gleason Indian paintbrush (*Castilleja gleasonii*), Southern tarplant (*Centromadia parryi* ssp. *Australis*), San Fernando Valley spineflower (*Chorizanthe parryi* var. *Fernandina*), Parry's spineflower (*Chorizanthe parryi* var. *parryi*), Santa Susana tarplant (*Deinandra minthornii*), recurved larkspur (*Delphinium recurvatum*), slender-horned spineflower (*Dodecahema leptoceras*), many-stemmed dudleya (*Dudleya multicaulis*), Ft. Tejon wooly sunflower, (*Eriophyllum lanatum* var. *hallii*), Tejon poppy (*Eschscholzia lemmonii* ssp. *Kernensis*), Mesa horkelia (*Horkelia cuneata* ssp. *puberula*), Comanche point layia (*layia leucopappa*), sagebrush loeflingia (*Loeflingia squarrosa* var. *artemisiarum*), Davidson's bush mallow (*Malacothamnus davidsonii*), Calico monkeyflower (*Mimulus pictus*), Flax-like monardella (*Monardella linoides* ssp. *Oblonga*), San Joaquin woollythreads (*Monolopia congdonii*), Plute Mountains navarretia (*Navarretia setiloba*), short-joint beavertail (*Opuntia basilaris* var. *brachyclada*), Bakersfield cactus (*Opuntia basilaris* var. *treleasei*), California Orcutt grass (*Orcuttia californica*), Plute mountains jewel-flower (*Streptanthus cordatus* var. *piutensis*), Mason's neststraw (*Stylocline masonii*).

Sensitive Wildlife Species: Forty-six special-status wildlife species have the potential to occur in the study area in this region based on the general types of habitat present. These include four special-status fish species, 14 special-status reptiles and amphibians, 20 special-status bird species, and eight special-status mammal species. Specific species include arroyo chub (*Gila orcutti*), Santa Ana sucker (*Catostomus santaanae*), steelhead—Southern California ESU—(*Oncorhynchus mykiss irideus*), unarmored threespine stickleback (*Casterosteus aculeatus williamsoni*), San Diego horned lizard (*Phrynosoma coronatum blainvillii*), arroyo toad (*Bufo californicus*), Tehachapi slender salamander (*Batrachoseps stebbinsi*), western spadefoot (*Spea*

hammondii), two-striped garter snake (*Thamnophis hammondii*), blunt-nosed leopard lizard (*Gambelia sila*), San Bernardino mountain kingsnake (*Lampropeltis zonata parvarubra*), California horned lizard (*Phrynosoma coronatum frontale*), California red-legged frog (*Rana aurora draytonii*), coast patch-nosed snake (*Salvadora hexalepis virgultea*), coast range newt (*Taricha torosa torosa*), silvery (California) legless lizard (*Anniella pulchra pulchra*), western pond turtle (*Clemmys marmorata*), the desert tortoise (*Gopherus agassizii*), Le Conte's thrasher (*Toxostoma lecontei*), least Bell's vireo (*Vireo bellii pusillus*), California condor (*Gymnogyps californianus*), Cooper's hawk (*Accipiter cooperii*), Swainson's hawk (*Buteo swainsoni*), western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), coastal California gnatcatcher (*Polioptila californica californica*), loggerhead shrike (*Lanius ludovicianus*), northern harrier (*Circus cyaneus*), prairie falcon (*Falco mexicanus*), Southern California rufous-crowned sparrow (*Aimophila ruficeps canescens*), southwestern willow flycatcher (*Empidonax traillii extimus*), summer tanager species (*Piranga rubra*), merlin (*Falco columbarius*), Bell's sage sparrow (*Amphispiza bellii bellii*), coastal cactus wren (*Campylorhynchus brunneicapillus couesi*), ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos*), tricolored blackbird (*Agelaius tricolor*), burrowing owl (*Athene cunicularia*), San Joaquin kit fox (*Vulpes macrotis mutica*), Tehachapi pocket mouse (*Perognathus alticola inexpectatus*), Mohave ground squirrel (*Spermophilus mohavensis*), San Joaquin antelope squirrel (*ammospermophilus nelsoni*), San Joaquin pocket mouse (*Perognathus inornatus inornatus*), Tipton kangaroo rat (*Dipodomys nitratooides*), San Diego desert woodrat (*Neotoma lepida intermedia*), and Los Angeles pocket mouse (*Perognathus longimembris brevinasus*).

Wildlife Movement/Migration Corridors: The South End San Joaquin Valley corridor allows movement of wildlife from the Los Padres National Forest to the Tehachapi Mountains and El Tejon Mountains and into the Sequoia National Forest. San Joaquin kit fox, short-nosed kangaroo rat, blunt-nosed leopard lizard, and Le Conte's thrasher are species used to characterize this corridor and are indicative of its habitat connectivity. SR-58, I-5, and gaps in vegetation cover along I-5, as well as the steep and hilly terrain of the area, pose significant barriers to animal movement in the corridor. Bridges, underpasses, and some continuous habitat located along and within this corridor facilitate animal movement.

The Southern Sierra corridor connects the Los Padres National Forest and the Angeles National Forest just south of the I-5 and SR-99 interchange. This corridor allows movement throughout the Tehachapi mountain range and crosses SR-58. Deer, bear, mountain lion, and bobcat are key species used to characterize this corridor and are indicative of its habitat connectivity. SR-58 and other roadways are significant barriers to animal movement in the corridor.

The San Gabriel-Tehachapi corridor connects the Angeles National Forest and the Tehachapi Mountains. Animal movement in the corridor is significantly impeded by private lands, agriculture, and existing development in the area. Existing California Department of Parks and Recreation and CDFG lands facilitate animal movement in the corridor.

The Castaic I-5 undercrossing corridor connects Los Padres National Forest with Angeles National Forest near Castaic Lake. Significant barriers to animal movement associated with the corridor area are SR-126 and I-5. Existing riparian habitat, underpasses, and bridges facilitate animal movement in the corridor.

The Soledad Canyon-Mint Canyon corridor allows movement throughout the Angeles National Forest. Mammals, three-spine stickleback, southwestern willow flycatcher, and western spadefoot are key species used to identify the corridor. SR-14 is the only significant impediment to animal movement in the corridor. The Santa Clara River and the Angeles and Los Padres National Forests facilitate animal movement through the corridor.

The Santa Clara River corridor allows movement along the Santa Clara River from the Pacific Ocean to the Angeles National Forest. Fish and birds are the key species used to characterize the corridor and are indicative of its habitat connectivity. Gaps in vegetation cover are significant barriers to animal movement in the corridor. Existing features facilitating animal movement through the corridor include riparian habitat and an absence of dams.

The I-5 Newhall Pass corridor allows movement from hills west of I-5 south of the I-5/SR-14 interchange to the Angeles National Forest. All San Gabriel Mountain mammals, mountain lions, bobcat, gray fox, deer, coyote, and black bear are key species used to characterize the corridor and are indicative of its habitat connectivity. Significant barriers to animal movement in the corridor are SR-14 and I-5. Existing features that facilitate animal movement through the corridor include the Los Pinetos SR-14 undercrossing (disturbed coast live oak woodland), the Gavin Canyon I-5 crossing (disturbed coast live oak woodland), and the I-5 Weldon Canyon overpass (road cut with buckwheat).

Water Resources: This is a diverse region that includes several types of waters and wetlands. These waters range from concrete-lined urban streams, reservoirs, and agricultural ditches to natural rivers, desert washes, and mountain lakes. The water and/or wetland system present in each area depends on a variety of factors, including substrate, groundwater levels, precipitation, topography, and human-made improvements. Lacustrine systems in the region include Castaic Lake and Palmdale Lake. Palustrine features include ponds and non-tidal wetlands dominated by trees, shrubs, mosses, or lichens, as well as vegetated wetlands traditionally referred to as marshes, swamps, bogs, fens, and prairie potholes. Riverine systems in the study area in the region include the Los Angeles River, the Santa Clara River, and several tributaries.

Conservation Plans: The Kern County Metropolitan-Bakersfield HCP, which covers 405 sq mi (652 sq km), is one of California's largest and most successful multi-species habitat conservation plans (MSHCPs). The plan was approved in 1994 to aid 13 federally and state-listed plant and wildlife species, including the San Joaquin kit fox, San Joaquin antelope squirrel, blunt-nosed leopard lizard, Tipton kangaroo rat, Bakersfield cactus, and California jewel-flower.

The Kern County Valley Floor HCP, which is in draft form, will cover 3,110 sq mi (5,005 sq km), located 20 mi (32 km) west of Bakersfield. It will include all of Kern County below 200 ft (61 m) elevation and on the valley floor. The plan will address eight species, including Bakersfield cactus, blunt-nosed leopard lizard, San Joaquin kit fox, and Tipton kangaroo rat.

The Coles Levee Ecosystem Reserve and the Kern Water Bank Authority, two existing conservation banks in Kern County, have established mitigation credits for valley saltbush scrub, valley sink scrub, Great Valley cottonwood riparian, and vernal playas, and support habitat for San Joaquin kit fox, Tipton kangaroo rat, blunt-nosed leopard lizard, and Swainson's hawk. Two other conservation banks under development in Kern County—the Chevron Lokern Conservation Bank and the Lost Hills District Mitigation Bank—will establish mitigation credits for San Joaquin Valley saltbush scrub, valley sink scrub, Great Valley cottonwood riparian, and vernal playas, and support habitat for Bakersfield saltbush (smallscale), Bakersfield cactus, San Joaquin kit fox, blunt-nosed leopard lizard, Tipton kangaroo rat, Swainson's hawk, and San Joaquin wooly-threads.

The proposed West Mohave Plan (WMP) is being prepared in collaboration with federal, state, and local governments in Inyo, Kern, Los Angeles and San Bernardino Counties. The Notice of Availability for the proposed West Mojave Plan and Final Environmental Impact Statement was published in the Federal Register on April 1, 2005 and is a result of over fourteen years of planning by the Bureau of Land Management (BLM) and 27 other federal and state agencies, cities and counties. The Plan consists of two components: (1) amend the existing 1980

California Desert Conservation Area Plan encompassing approximately 3.3 million acres of public land administered by the BLM, and (2) a Habitat Conservation Plan for development on 3.0 million acres of public land administered by the BLM, and (2) a Habitat Conservation Plan for development on 3.0 million acres of private land. The purpose of the WMP is to develop conservation strategies for over 100 Federal and state-listed plant and animal species located within the western Mojave Desert and to simplify procedures for complying with the Federal and State Endangered Species Acts. The Desert Tortoise Preserve Committee and Desert Tortoise Council issued a formal protest of the West Mohave Plan on May 1, 2005. The Biological Opinion from the United States Fish and Wildlife Service has not yet been obtained and the California Department of Fish and Game has raised some concerns on the ability of the proposed HCP conservation measures to "fully mitigate" as required by the California Endangered Species Act.

Los Angeles to San Diego via Inland Empire

Regional Summary: This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas, and south to San Diego generally along the I-215 and I-15 corridors. The dominant land use pattern from Los Angeles Union Station (LAUS) to Ontario Airport consists of heavily developed and urbanized settings. Except for small patches of annual grasslands and coastal sage communities, there are no contiguous natural communities along this segment. In the north-south orientation, the land cover is generally dominated by a patchwork of agricultural land use (orchards and vineyards) and urban areas along the I-215 corridor. Orchards and vineyards dominate south of the San Luis Rey River until north of Escondido. South of Lake Hodges, the land use is predominantly urban. South of Carroll Canyon toward the City of San Diego, Mission Bay, and San Diego Bay, the land use is heavily urban.

The topography along the entire corridor in the east-west orientation, from LAUS to March Air Reserve Base (ARB) segment, is generally flat. The terrain remains relatively flat through Riverside and heading into Perris Valley and Sun City, and becomes relatively steep south of Murrieta and Temecula Valley and further south towards Rainbow Valley. The terrain continues to be relatively steep until Escondido, along the north-south orientation, adjacent to the I-215 corridor. The terrain is also steep near the proposed Mira Mesa station and further south of Carroll Canyon.

Vegetation communities in the study area in this region include annual (nonnative) grasslands, coastal sage scrub, chamise redshank chaparral/mixed chaparral, southern cottonwood willow riparian, southern sycamore-alder riparian woodland, riparian scrub oak, orchards and vineyards, lacustrine wetlands, vernal pools, San Jacinto Valley vernal pools, and San Diego Mesa hardpan vernal pools.

Sensitive Vegetation Communities: The sensitive vegetation communities in this study area include annual grasslands, coastal sage scrub, chamise redshank chaparral/mixed chaparral, southern riparian forest that includes southern cottonwood willow riparian and southern sycamore-alder riparian woodland, and riparian scrub.

Sensitive Plant Species: A total of 22 CNPS List 1B plants, 13 federally and state-listed species, and one federally proposed species occur in the study area in this region. Sensitive plant species include Briand's phacelia (*Phacelia stellaris*), southern skullcap (*Scutellaria bolanderi* ssp. *Austreomontana*), marsh sandwort (*Arenaria paludicola*), Robinson's pepper-grass (*Lepidium virginicum* var. *robinsonii*), intermediate mariposa lily (*Calochortus weekii* var. *intermedius*), Culter's goldfields (*Lasthenia glabrata* ssp. *Coulteri*), Jaeger's milk-vetch (*Astragalus pachypus* var. *jaegeri*), Orcutt's brodiaea (*Brodiaea orcuttii*), Ramona horkelia (*Horkelia truncata*), San Jacinto Valley crownscale (*Atriplex coronata* var. *notatior*), smooth tarplant (*Centromadia pungens* ssp. *Laevis*), summer holly (*Comorostaphylis diversifolia* ssp. *Diversifolia*), San Diego

ambrosia (*ambrosia pumila*), Encinitas baccharis (*Baccharis vanessae*), Nuttall's scrub oak (*Quercus dumosa*), southern tarplant (*Centromadia parryi* ssp. *Australis*), long-spined spineflower (*Chorizanthe polygonoides* var. *longspina*), oil nestraw (*Stylocline citrileum*), San Diego button celery, (*Eryngium aristulatum* var. *parishii*), San Diego goldstar (*Muilla clevelandii*), San Diego mesa mint (*Pogogyne abramsii*), San Diego thorn-mint (*Acanthomintha ilicifolia*), willow monardella (*Monardella linoides* ssp. *Vimineae*), lakeside ceanothus (*Ceanothus cyaneus*), and Otay mesa mint (*pogogyne nudiuscula*).

Sensitive Wildlife Species: Fifteen special-status wildlife species have the potential to occur in the study area in this region based on the general types of habitat present as identified in the CNDDDB database. These include two special-status fish species, four special-status reptiles and amphibians, six special-status bird species, and three special-status mammal species. Species with potential to occur include Santa Ana sucker (*Catostomus santaanae*), arroyo chub (*Gila orcutti*), San Diego horned lizard (*Phrynosoma coronatum blainvillei*), orange-throated whiptail (*Cnemidophorus hyperythrus*), southwestern arroyo toad (*Cila orcutti*), western spadefoot (*Scaphiopus hammondi*), least Bell's vireo (*Vireo bellii pusillus*), California gnatcatcher (*Poliophtia californica*), western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), western snowy plover (*Charadrius alexandrinus nivosus*), light-footed clapper rail (*Rallus longirostris levipes*), burrowing owl (*Athene cunicularia*), Stephen's kangaroo rat (*Dipodomys stephensi*), Los Angeles pocket mouse (*Perognathus longemembris brevinasus*), and northwestern San Diego pocket mouse (*Perognathus fallax fallax*).

Wildlife Movement/Migration Corridors: Sensitive natural areas that provide wildlife movement/migration corridors predominantly occur in association with aquatic systems (streams/rivers) in this region. Potential wildlife migratory corridors include Rio Hondo, San Gabriel River, Santa Ana River, Temecula Creek, Murrieta Creek, Box Springs Reserve, San Jacinto River, San Luis Rey River, Lake Hodges/San Dieguito Marsh, Carroll Canyon, Rose Canyon, San Marcos Creek, Escondido Creek, San Clemente Canyon, Rainbow Creek, and San Diego River. These aquatic systems support riparian vegetation that provides food and cover, enhancing the migratory qualities of the habitat.

Important regional wildlife corridors also may be found adjacent to I-215 near Perris, in the vicinity of March ARB, off I-15 near Clinton Keith Road south of the City of Riverside, and in the Los Peñasquitos Canyon Preserve intersected by I-15 near Marine Corps Air Station (MCAS) Miramar. There also are corridors at MCAS Miramar associated with San Clemente Canyon and Rose Canyon and at the Mission Trails Regional Park intersecting I-15 and SR-163.

Water Resources: Many waters of the U.S., including unnamed drainages, traverse the region. A majority of the water bodies, or portions thereof, traversing the LAUS to March ARB proposed segment are channelized. These streams include the Los Angeles River, San Gabriel River, Rio Hondo, San Jose Creek (City of Industry), Etiwanda Channel, and Cucamonga Creek (City of Ontario).

Along the north-south segment (March ARB to Mira Mesa), Perris Valley storm drain (San Jacinto River Channel), San Clemente Canyon, Carroll Canyon, San Diego Aqueduct, San Diego River, Escondido Creek, and Cypress Canyon are channelized and occur in predominantly urbanized areas. Non-channelized water bodies along this alignment include Murrieta Creek, Rainbow Creek, San Luis Rey River, Keys Creek, San Marcos Creek, Lake Hodges/San Dieguito River, Los Peñasquitos Canyon, Rose Canyon, and portions of Carroll Canyon.

Scattered freshwater wetlands associated with the drainage are found along the March ARB to Mira Mesa and Mira Mesa to San Diego segments. These include palustrine wetlands along Murrieta Creek, palustrine emergent marsh, artificially created emergent wetlands associated

with San Luis Rey River, and lacustrine and palustrine emergent marshes in association with Lake Hodges and San DeGette Lagoon. Patches of San Diego mesa hardpan vernal pools occur near the proposed Mira Mesa station just north of MCAS Miramar, south of Soledad Freeway, north of San Clemente Canyon, just south of Escondido Freeway, and north of Carroll Canyon.

A number of small lacustrine wetlands, predominately human-made detention ponds that have been naturalized, are scattered along I-10. The most sensitive and biologically productive wetland along the entire study area in this region is the lacustrine/palustrine marsh wetlands associated with the Lake Hodges/San Dieguito River off I-215. There are an estimated 46 ac (19 ha) of estuarine wetlands within the San Diego Airport study area.

A number of vernal pool complexes exist in the areas between Mira Mesa and San Diego, primarily in the I-15 corridor and on and around MCAS Miramar. The vernal pools are documented by the U.S. Fish and Wildlife Service in the "Vernal Pools of Southern California Recovery Plan," 1997.

Conservation Plans: The San Diego County MSCP is a comprehensive habitat conservation program that addresses multiple species' habitat needs and the preservation of native vegetation communities for a planning area encompassing 900 sq mi (1,448 sq km) in southwestern San Diego County (www.dfg.ca.gov/nccp/mscp). The MSCP is a subregion of the NCCP's coastal sage scrub region. It is one of three subregional habitat conservation efforts in San Diego County that contribute to preservation of regional biodiversity through coordination with other habitat conservation planning efforts throughout southern California. Completed in 1998, the MSCP targets 171,917 ac (69,573 ha) of open space for conservation within the planning area. This includes 167,667 ac (67,853 ha), or more than half of all remaining natural habitat areas, and 4,250 ac (1,720 ha) of other open spaces (such as disturbed and agricultural lands) that contribute to conservation objectives.

The North San Diego County MSHCP, along the county's northern coast, covers conservation of many natural communities, including vernal pools. In the study area in this region, the following critical habitat units⁶ are designated to protect specific species.

- Gnatcatcher: MSHCP units near the campus of the University of California at Riverside in Murrieta and Temecula. The East Los Angeles County Matrix NCCP is located near the City of Industry. In addition, a unit near Escondido, as part of the North County subarea of the MSHCP for unincorporated San Diego County, and an area near Lake Hodges (North San Diego County MSHCP), have been designated.
- Least Bell's vireo: at San Luis Rey River (Unit No. F).
- San Bernardino kangaroo rat: at Etiwanda Alluvial Fan Unit near Fontana, and at Lytle and Cajon Creeks Unit in San Bernardino County.
- Southwestern willow flycatcher: at San Luis Rey River (Unit No. 17), and at San Dieguito River (San Dieguito River Unit).
- Southwestern arroyo toad: at San Luis Rey River (Unit No. 14).

⁶ USFWS designates critical habitat maps that show areas or units of habitat considered essential to the protection of threatened and endangered species.

The following are proposed critical habitats in the study area in this region.

- Vernal pools critical habitat (San Jacinto-Hemet Unit No. 33 A) near Perris in Riverside County associated with San Jacinto River and consisting of 5,730 ac (2,319 ha) (50 C.F.R. part 17, vol. 67, No. 185, Tuesday, September 24, 2002).
- Critical habitat (Southwest Riverside Unit) for Quinoa checkerspot butterfly near the I-15 and I 215 junction near Murrieta (50 C.F.R. part 17, vol. 66, No. 26; Tuesday, February 7, 2001).

Los Angeles to San Diego via Orange County

Regional Summary: This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County I-5 highway corridor. The entire study area in this region lies within the South Coast Bioregion, an area of contrasting landscapes ranging from coastal mountains, canyons, streams and river valleys, rolling hills, and beaches to densely populated cities. The region more specifically lies within the Peninsular Range Physiographic Province. This area is characterized by a Mediterranean climate with winter rainfalls and summer droughts. Average annual rainfall ranges from 9 in (23 cm) in the San Diego region to 15 in (38 cm) in the Los Angeles basin.

In San Diego County, the study area is further characterized by the presence of large coastal wetlands, including six lagoons located in the northern region of the county. These lagoons and the associated open space around them provide vital habitat for resident and migratory birds and other wildlife. Sensitive plant and animal species are found here in substantial numbers despite increasing urbanization, hydrological changes in the watershed, and limited tidal action.

The vegetation communities found in the study area include urban-agricultural and Diegan coastal sage scrub communities. Urban-agricultural vegetation is highly disturbed and widespread within existing residential/commercial, farming, and landscaped areas and may include flower farms, strawberry and vegetable farms, vineyards, and other irrigated uses. Diegan coastal sage scrub is the most commonly found sage scrub community in coastal southern California, ranging from Los Angeles to Baja. This coastal sage scrub community is dominated by low soft-leaved, drought-deciduous shrubs and is typically found on dry sites and steep slopes.

Sensitive Vegetation Communities: Although urban-agricultural vegetation is likely to provide foraging habitat for some wildlife species (e.g., red-tailed hawks, coyotes), it is not considered a sensitive vegetation community. Diegan coastal sage scrub, however, is considered sensitive and provides habitat for many endangered and threatened species. This vegetation community has suffered severe reductions compared to historic levels from spreading urbanization. For the purposes of this program-level analysis, Diegan coastal sage scrub is considered the dominant sensitive vegetation in the study area in this region.

Lagoons and other wetlands are also considered to encompass sensitive vegetation. Sensitive vegetation communities include southern maritime chaparral, succulent sage scrub, southern riparian scrub, southern riparian forest, southern cottonwood willow riparian, Torrey pine forest, southern dune scrub, southern foredunes, southern coastal salt marsh, coastal brackish marsh, and San Diego mesa hardpan vernal pool.

Sensitive Plant Species: The mosaic of vegetation communities that make up Diegan coastal sage scrub and the lagoon/wetlands supports a variety of sensitive plant species. A total of 28 CNPS List 1B plants and nine federally and state-listed species have the potential to occur in the

study area. The nine federally and state-listed species include Del Mar manzanita (*Arctostaphylos glandulosa* ssp. *crassifolia*), coastal dunes milk-vetch (*Astragalus tener* var. *titi*), Orcutt's spineflower (*Chorizanthe orcuttiana*), San Fernando Valley spineflower (*Chorizanthe parryi* var. *Fernandina*), salt marsh bird's beak, (*Cordylanthus maritimus* ssp. *maritimus*), many-stemmed dudleya (*Dudleya multicaulis*), San Diego button-celery (*Eryngium aristulatum* var. *parishii*), spreading navarretia (*Navarretia fossalis*), California Orcutt grass (*Orcuttia Californica*).

Sensitive Wildlife Species: Twenty-six special-status species have the potential to occur in the study area in this region, based on the general habitat types present. These include two sensitive invertebrate species, three special-status fish species, six special-status reptiles and amphibians, 11 special-status bird species, and four special-status mammals: San Diego fairy shrimp (*Branchinecta sandiegonensis*), Riverside fairy shrimp (*Streptocephalus woottoni*), tidewater goby (*Eucyclogobius newberryi*), arroyo chub (*Cila orcutti*), southern steelhead trout (*Oncorhynchus mykiss irideus*), arroyo toad (*Bufo Californicus*), orange-throated whiptail (*Cnemidophorus hyperythrus*), coastal western whiptail (*Cnemidophorus tigris multiscutatus*), northern red-diamond rattlesnake (*Crotalus Exsul*), San Diego horned lizard (*Prynosoma coronatum blainvelleri*), western spadefoot (*Scaphiopus hammondi*), southern California rufous-crowned sparrow (*Simophila ruficeps canescens*), coastal cactus wren (*Campylorhynchus brunneicapillus couesi*), western snowy plover (*Charadrius alexandrinus nivosus*), northern harrier (*Circus cyaneus*), California black rail (*Laterallus jamicensis coturniculus*), Belding's savannah sparrow (*Passerculus sandwichensis beldingi*), coastal California gnatcatcher (*Polioptila Californica*), light-footed clapper rail (*Rallus longirostris levipes*), bank swallow (*riparia riparia*), California least tern *Sterna antillarum browni*), least Bell's vireo (*Vireo Bellii pusillus*), northwestern San Diego pocket mouse (*Chaetodipus fallax fallax*), Stephens' kangaroo rat (*dipodomys stephensi*), San Diego desert woodrat (*Neotoma lepida intermedia*), and Pacific pocket mouse (*Perognathus longimembris pacificus*).

The San Diego fairy shrimp, tidewater goby, coastal California gnatcatcher, and least Bell's vireo may potentially be designated critical habitats in the region (and potentially in the corridor/alignment study area) as defined by USFWS.

Wildlife Movement/Migration Corridors: Only large open areas, lagoons and surrounding park or reserve areas, and riparian areas in undeveloped areas are considered potential wildlife movement corridors in this region. These include San Juan Creek; Camp Pendleton Marine Corps Base (including San Mateo Creek, San Onofre Creek, and Santa Margarita River); San Luis Rey River; Buena Vista Lagoon; Aqua Hedionda Lagoon; Batiquitos Lagoon; San Elijo Lagoon; San Dieguito River and Lagoon; Los Peñasquitos Lagoon; Peñasquitos Creek and Canyon; Sorrento Valley, Rose Canyon; and San Clemente Canyon.

Water Resources: The estuarine lagoons of northern San Diego County are within the coastal zone. They are a unique biological resource and are the focus of many resource agencies and other entities interested in the quality of these areas. Six lagoons are located in the in the region: Buena Vista, Agua Hedionda, Batiquitos, San Elijo, San Dieguito, and Los Peñasquitos.

Vernal pool, a potential component of coastal sage scrub or chaparral landscapes, is considered another type of wetland. Vernal pools are likely to exist within the study area in this region, particularly on the Camp Pendleton Marine Corps Base. There are potentially more than 25 major non-wetland waters in the region.

Conservation Plans: Other than the potential USFWS-designated critical habitats described in the sensitive plants discussion above, there are no conservation plans identified in this region. The Batiquitos Lagoon at the southern edge of Carlsbad is 600 ac (243 ha) and was made a CDFG-designated State Ecological Reserve in 1983. The San Elijo Lagoon located between Encinitas

and Solana Beach is a CDFG-designated State Ecological Reserve. A portion of the San Dieguito Lagoon at the northern edge of the City of Del Mar is also a CDFG-designated State Ecological Reserve, as is the recently designated Los Peñasquitos Lagoon State Preserve.

3.15.3 Environmental Consequences

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The biological resources and wetlands described above in the affected environment section (Section 3.15.2) characterize the existing conditions in the five regions potentially affected by the alternatives, drawing primarily from existing available data, with gaps in data in some areas. Because this is a program-level analysis, data are representative rather than complete, and are for comparison purposes.

Though some changes may occur between the existing conditions and the year 2020 due to natural changes in resources as well as urbanization and transportation projects that would be implemented by 2020 under the No Project Alternative, attempting to estimate the extent of these changes would be speculative at this time. Further, it is assumed that each of the projects associated with the No Project Alternative would incorporate and implement the appropriate mitigation and monitoring measures to minimize or avoid considerable impacts on sensitive biological and wetland resources. It is also realistic to project that urbanization in some of the regions resulting from population growth over the next 17 years (to 2020) would change the conditions reported in this document, and that continued efforts by local communities and nonprofit organizations (e.g., The Nature Conservancy) would continue to expand protected areas (habitat conservation planning areas). Because estimating the extent of change prior to 2020 would be speculative, no substantial change to the existing conditions is assumed for purposes of this program-level evaluation and comparison of alternatives.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

The existing conditions associated with the No Project Alternative are used as a baseline for comparison with the changes or impacts that would potentially result from either the Modal or HST Alternatives. Though potential impacts would vary from segment to segment along the Modal and HST Alternatives, overall, based on available information for each of the study areas along corridors and alignments, the Modal Alternative would potentially affect a greater area or number of sensitive biological and wetland resources than HST alignment options. Because of the higher potential for impacts under the Modal Alternative, associated mitigation measures are expected to be more extensive and thus more expensive than under the HST Alternative.

This section provides a general comparison of resources potentially impacted by the Modal and HST Alternatives. The following section compares the potential impacts of the alternatives by region.

Modal and HST Alternatives

Because there are several alignment and station options for the HST Alternative, a range of potential impacts was developed that represents the options with the fewest to the greatest potential impacts on biological and wetland resources within a region for purposes of a broad, program-level review.

Affected Environment

Using existing data and information as the basis for the evaluation, approximately 77,018 ac (31,168 ha) of sensitive vegetation are present in the study area for the Modal Alternative, which is substantially more than the approximately 9,773 ac (3,955 ha) to 17,619 ac (7,130 ha) present in the study area for the HST Alternative. Approximately 5.3 million ft (1.6 million m) of non-wetland waters are present in the Modal Alternative study area, which is substantially more than the up to 1.2 million ft (0.4 million m) present in the HST Alternative study area. Approximately

23,172 ac (9,377 ha) of wetlands are potentially present in the Modal Alternative study area compared to approximately 3,996 ac (1,617 ha) to 18,356 ac (7,428 ha) for the HST Alternative. There were 321 special-status species identified as potentially present in the study area for the Modal Alternative, compared to a range of 279 to 350 for the HST Alternative. Table 3.15-1 summarizes the biological resources and wetlands present within the potentially affected environment.

The proposed Modal and HST alternatives would have potential to affect wildlife movement/migration corridors throughout the study area. Figures 3.15-1A and 3.15-1B illustrate the known wildlife movement corridors throughout the overall study area and general areas where the movement corridors cross proposed highway improvements in the Modal Alternative and the alignment options in the HST Alternative.

Construction activities for either the Modal or HST alternative could affect stormwater quality by releasing sediment and/or chemicals onto the ground or directly into water courses. Construction activities could increase sediment load in stormwater during rainfall events. Sediment sources created during construction include soil stockpiles, soil tracked across construction areas, and soil transported by wind. Mismanagement of on-site excavated or imported construction materials could result in release of sediments directly into creeks at above-ground stream crossings or into the storm drainage system and subsequently into creeks.

Excavated soil could be contaminated, and release of contaminated sediments could pollute surface water sources. Retained cuts could expose the soil to run off and potentially cause erosion and entrainment of sediment in the runoff. Soil stockpiles could be exposed to runoff and, if not managed properly, runoff could cause erosion and increased sedimentation directly into receiving water bodies at stream crossings, in storm sewers, or in drainage channels.

In addition to erosion, there is a potential for chemical releases at construction sites. Once released, substances such as fuels, oils, paints, and solvents could be transported to nearby drainage channels.

Earthwork for the Modal and HST alternatives would involve excavations and fill construction, producing potential erosion and sedimentation problems if not properly designed, constructed, and maintained. Stockpiles of excavated solid and imported fill, if properly managed, should not be sources of sedimentation. If, however, construction-related erosion and sedimentation were to occur, it could result in impacts to surface water quality and drainage channel maintenance.

Dewatering operations for excavations could result in discharge of sediments and/or pollutants to surface water bodies, thereby degrading water quality. High sediment content in dewater discharges is common because of the nature of the operation, in which soil and water mix in the turbulent flow of high-volume pump intakes.

Direct discharge of dewatering effluent to a storm drainage system could result in water quality impacts to downstream drainages.

Representative Impacts

Table 3.15-1A presents the representative impacts on biological resources and wetlands from disturbance to or fragmentation of habitat due to construction and operation of the Modal and HST Alternatives.

Table 3.15-1
Summary of Potential Impacts on Biological Resources within the Potentially Affected Area for Modal and HST Alternatives

Region	Sensitive Vegetation in Acres (Hectares)	Wildlife Movement Corridor (Yes/No)	Non-wetland Jurisdictional Waters in Linear Feet (Meters)	Wetlands in Acres (Hectares)	Marine/Anadromous Fish Resources (Yes/No)	Number of Special-Status Species
Modal Alternative						
Bay Area to Merced	1,323 (535)	Y	4,630,791 (1,411,465)	6,384 (2,583)	Y	80 (72,246 ac [29,237 ha])
Sacramento to Bakersfield	52,535 (21,260)	Y	59,329 (18,083)	10,158 (4,111)	Y	50
Bakersfield to Los Angeles	2,773 (1,122)	Y	172,656 (52,625)	547 (221)	Y	23
Los Angeles to San Diego via Inland Empire	14,321 (5,795)	Y	401,531 (122,387)	859 (348)	N	65
Los Angeles to San Diego via Orange County	6,066 (2,455)	N	119,525 (36,431)	5,224 (2,114)	N	103
Total Modal Alternative	77,018 (31,168)	Y	5,383,832 (1,640,992)	23,172 (9,377)	Y	321
High-Speed Train Alternative						
Bay Area to Merced	455–812 (184–329)	Y	322,390–650,073 (98,264–198,142)	576–10,721 (233–4,339)	Y	24–38 (13,705–18,613 ac [5,546–7,532 ha])
Sacramento to Bakersfield	1,227–4,696 (496–1,900)	Y	26,455–70,720 (8,063–21,555)	1,601–5,540 (648–2,242)	Y	22–40
Bakersfield to Los Angeles	482–1,616 (195–654)	Y	101,904–146,784 (31,060–44,740)	231–400 (93–162)	Y	14–23
Los Angeles to San Diego via Inland Empire	7,609–10,301 (3,079–4,169)	Y	273,699–353,837 (83,423–107,849)	701–751 (284–304)	N	53–77
Los Angeles to San Diego via Orange County (HST corridor)	0	N	9,880–23,760 (3,011–7,242)	1–2 (0.4–0.8)	N	14–17
Los Angeles to San Diego via Orange County (conventional rail corridor)	0–194 (0–78)	Y	75,350–92,067 (22,967–28,062)	886–942 (358–381)	Y	152–155
Total HST Alternative	9,773–17,619 (3,955–7,130)	Y	783,223–1,266,521 (238,726–386,036)	3,996–18,356 (1,617–7,428)	Y	279–350

Table 3.15-1A
Summary of Representative Impacts on Biological Resources for Modal and HST Alternatives

Region	Representative Impacts ⁷		
	Wetlands Acres (Hectares)	Species ⁸ #	Habitat ⁹ Acres (Hectares)
Modal Alternative			
Bay Area to Merced	35.8 (14.5)	21	278.3 (112.6)
Sacramento to Bakersfield	51.3 (20.8)	19	799.3 (323.5)
Bakersfield to Los Angeles	6.5 (2.6)	10	139.6 (56.5)
LA - Riverside – San Diego	2.1 (0.8)	19	152.5 (61.7)
LA – Orange Co. - San Diego	3.9 (1.6)	21	106.7 (43.2)
Total Modal Alternative	100 (40.5)	90	1,476 (597.3)
High Speed Train Alternative			
Region	Representative Impacts ¹⁰		
	Wetlands Acres (Hectares)	Species ⁸ #	Habitat ⁹ Acres (Hectares)
Bay Area to Merced	3-74 (1.2-29.9)	16-25	260-337 (105.2-136.4)
Sacramento to Bakersfield	15-22 (6.1-8.9)	25-28	NA
Bakersfield to Los Angeles	2-14 (0.8-5.7)	12-14	154-238 (62.3-96.3)
Los Angeles to Irvine	NA	NA	NA
Los Angeles to San Diego	1.5-5.3 (0.6-2.1)	20-26	188-266 (76.1-107.6)
Total HST Alternative	30-89 (12.1-36)	67-84	1,201-1,568 (486-634.5)

⁷ Based on Representative Facility Footprint

⁸ Special Status Species per California Department of Fish and Game, Natural Diversity Database 2004

⁹ Special Status Species Habitat per California Department of Fish and Game, Natural Diversity Database 2004

¹⁰ Based on Representative Facility Footprint. Impacts could be greatly reduced through avoidance and minimization methods at the project level.

Modal Alternative

The highway improvements under the Modal Alternative focus entirely on existing corridors and facilities and would comprise more miles of alignment (linear improvement) statewide than the HST Alternative. The potential expansion of lanes on existing highways would require extensive cut-and-fill through mountain passes to accommodate the lanes and associated interchange widening. One example is the potential highway widening of the existing I-5 through the Grapevine where extensive cut and fill would be necessary in steep mountain terrain. Federally and state-listed plant and animal species in the Grapevine area along I-5 between SR-99 and SR-14 that could potentially be affected by lane expansions include slender-horned spineflower, San Fernando Valley spineflower, Santa Ana sucker, Arroyo toad, San Joaquin kit fox, Tehachapi slender salamander, unarmored threespine stickleback, and San Joaquin antelope squirrel. Vegetation communities in the Grapevine segment that would be subject to potential impacts from widening I-5 include California walnut woodland, Riversidean alluvial fan sage, southern cottonwood willow riparian forest, southern willow scrub, valley needlegrass grassland, and valley oak woodland.

Additional right-of-way necessary under the Modal Alternative would potentially include some areas of currently undeveloped natural vegetation. For example, right-of-way needed for potential widening of SR-152 near Gilroy passes through the natural area of Pacheco Pass in the Diablo Range. Also, bridges and overpasses would be widened in urban, suburban, coastal, and open space environments, increasing the footprint of the highway and potential shadow effects¹¹ beneath the infrastructure. Bridge widening would be of concern in areas where the existing bridge columns and approaches impede tidal flow, such as the lagoon areas of northern San Diego County.

High-Speed Train Alternative

The proposed HST Alternative would generally be located in or adjacent to existing transportation rights-of-way such as highways or railroads, or would be in tunnels or elevated through mountain passes and sensitive habitat areas. The HST Alternative would include several tunnels, which could avoid or substantially reduce surface impacts on sensitive biological resources except at tunnel portal areas. The footprint of bridges across bodies of water such as lagoons in San Diego would not be increased under the proposed HST Alternative because new bridges would replace older bridges, and the new bridges would use materials and designs to minimize the number of piles/columns in the water and would retain the same or smaller footprint of the span. The east-west HST options across the Diablo Range and across the western portion of the San Joaquin Valley would potentially impact wildlife movement/migration corridors for the San Joaquin kit fox.

In general, railroad corridors have been found to have the following environmental advantages over highways: 1) Water drains away from the track-bed, maintaining a dry environment that prevents unwanted vegetation from establishing. 2) The track-bed has a porous, stable base that prevents runoff from concentrating, keeps slope erosion to a minimum, and filters out particulates and chemical pollutants. 3) A service road or other narrow access strip running alongside the track-bed prevent spoils from shifting beyond the toe of the track-bed slope. 4) Drainage ditches parallel to the track-bed prevent uncontrolled erosion, act as sediment traps, filter railway runoff, and insulate adjoining land from uncontrolled channel flow. 5) High Speed Rail (HSR) construction usually has a significantly smaller footprint than road construction, so it has less long-term and short-term impacts. 6) HSR corridors are narrower than roads, so animals are more willing to cross under them. This is a significant advantage. 7) It is more feasible to elevate an HSR system on pile-supported structures than to elevate a road.

¹¹ *Shadow effect* refers to shading of plants that would affect access to sunlight and health of the plants.

"Elevated corridors on bridges or viaducts undoubtedly have the less disruptive impact on wildlife movement and migration passageways." (DeSanto, R.S. and D.G. Smith; Environmental auditing: an introduction to issues of habitat fragmentation relative to transportation corridors with special reference to high-speed rail (HSR); Environmental Management 17:111-114; 1993)

3.15.4 COMPARISON OF ALTERNATIVES BY REGION

The potential impacts on biological resources and wetland/water resources that could result from the Modal and HST Alternatives through each of the regions are summarized above in Table 3.15-1. To allow a reasonable means of comparing the impacts of the alternatives and to estimate a range of potential areas of impact on biological resources for each region, the various options for the HST Alternative were considered combined for each region. For a summary of the potential impacts on biological resources for all alignment and station options for each region see Appendix 3.15-D.

As discussed earlier, all comparisons are based on information currently available from existing databases. Field surveys, which would be performed during a subsequent environmental review, would provide more detailed information and could indicate an increase or a decrease in the potential impacts on biological resources from a proposed HST system, particularly along routes that have not previously been the focus of field surveys or mapping by any of the regulatory agencies (such as CDFG or USFWS).

A. BAY AREA TO MERCED

Figures 3.15-1 and 3.15-2 show the general locations of sensitive habitat and wetlands in the Bay Area to Merced region. The Modal and HST Alternatives would have the potential to result in potential adverse impacts on the following resources.

- Several special-status species, including the California red-legged frog and San Joaquin kit fox.
- Sensitive plant communities and sensitive habitat, including marsh, chenopod (alkali) scrub, valley sink scrub, riparian woodlands (e.g., sycamore alluvial woodland), and valley oak woodland plant communities.
- Sensitive habitat of concern, such as freshwater emergent wetland.
- San Joaquin kit fox foraging habitat.
- Oak trees.
- Streams below top-of-bank, including riparian corridors.
- Anadromous fish habitat.
- Wetlands and waters at a level that may require an Individual Permit and Section 404(b)(1) Analysis of Alternatives, which would be addressed in a subsequent environmental review.

Modal Alternative

The Modal Alternative could result in potential impacts on several hundred sensitive plant communities, including possibly more than 278 ac (112.5 ha) of habitat for 21 special-status species in the study area in this region. The Modal Alternative could also impact more than 9,800 linear ft (2,987 linear m) of streams, about 14 ac (5.7 ha) of other water bodies, and more than 6,300 ac (2,550 ha) of NWI wetlands. This would constitute a potentially high impact.

The Modal Alternative potentially would impact hydric soils (indicator of wetlands), serpentine soils (substrate for several special-status species), and oak trees. Expanding SR-152 by two lanes between Gilroy and Hollister would potentially impact sensitive habitat in the study area for the red-legged frog, and the San Joaquin kit fox in the Diablo Range, as well as other special-status species, because it would require extensive cut-and-fill work in some areas to

accommodate lane additions. The Modal Alternative would include extending existing infrastructure (bridges, culverts, abutments, and fill) to accommodate additional lanes, and would be expected to include mitigation for potential wildlife and biological impacts. However, providing sufficient mitigation for compliance with CWA requirements for wetlands and waters would likely be difficult and challenging. For example, along the I-880 corridor between Oakland and San Jose, almost all onsite wetland mitigation sites have been taken for previous freeway widening projects. Mitigation along the I-880 corridor would need to be undertaken elsewhere offsite.

High-Speed Train Alternative

The HST Alternative in the Bay Area to Merced region would potentially result in impacts similar to those associated with the Modal Alternative along the west-east segments across the Diablo Range where potential impacts on threatened and endangered species, including the San Joaquin kit fox, are possible. The kit fox has a wide distribution, using the spine of the Diablo Range as a north-south movement corridor. The California red-legged frog occupies corresponding valley wetlands and riparian corridors. Efforts to conserve the California tiger salamander are increasing, and USFWS has proposed listing it as a threatened and endangered species.

The proposed HST Alternative alignment options would create new transportation corridors in this region that would have the potential to fragment habitat for threatened and endangered species in the Diablo Range.

The proposed HST Alternative alignment options would have the potential to affect wildlife movement/migration corridors in this region, primarily for terrestrial mammals, depending on the selection of a final alignment. Because the proposed routes between both San Francisco and Gilroy and Oakland and Gilroy are along existing rail corridors, little impact on movement/migration routes would be anticipated. The potential for impacts would be expected to occur mainly along the east-west HST options through the Diablo Range (Diablo Range direct) and across the western portion of the San Joaquin Valley. Portions of these alignments are proposed to be in tunnels (between 11 mi [18 km] and 16 mi [26 km], depending on alignment option) and the segments in tunnels would not hinder wildlife movement. Segments that would be placed at grade (cut and fill) would require fencing the HST alignment for the safety of humans, as well as protection from train-wildlife collisions, and would have the potential to interfere with wildlife movement. Placement of overpasses, underpasses, and tunnels along these alignments could provide for movement of wide-ranging and migratory species. The proposed HST Alternative would potentially impact a relatively small percentage of wetlands compared to the Modal Alternative (from approximately 2.8% for the Bay Area to Merced segment with the Oakland to San Jose East plus tunnel under Henry Coe State Park, to about 6.7% for the Hayward/Niles/Mulford alignment plus the south line Gilroy station option). The major wetland features in this region include the San Francisco Bay. With the exception of the Mulford Line, the HST alignment options would be able to avoid or limit potential impacts on these features (see Figure 3.15-2). The Modal Alternative would potentially affect 36 ac (14.6 ha) total acres of wetlands in the region, compared to potential impacts on between 3 ac (1.2 ha) and 74 ac (29.9 ha) for the HST Alternative, depending on the alignment options.

High-Speed Train Alignment Option Comparisons

The Hayward/Niles/Mulford alignment option would pass through the Don Edwards San Francisco Bay National Wildlife Refuge adjacent to the existing rail line, potentially impacting substantially more wetlands (25 ac [10.1 ha]) than the Hayward alignment/I-880 (1.3 ac [0.5 ha]). The Mulford alignment option potentially impacts habitat for special-status shorebirds and waterfowl, including the endangered California clapper rail. The Mulford alignment option would pass through important wetlands and tidal salt marsh that supports endangered species such as the salt marsh harvest mouse, steelhead, western snowy plover, and red-legged frog.

The HST segment using the northern tunnel under Henry Coe option would involve the fewest wetland impacts. Of the three Diablo Range direct options, the northern tunnel alignment would potentially affect fewer special-status species than other alignment options. The Diablo range direct options would also have potential impacts on aquatic resources of national importance (ARNII) along the Orestimba Creek.

B. SACRAMENTO TO BAKERSFIELD

The No Project, Modal, and HST Alternatives would all cross sensitive areas of biological resources, including habitats of endangered species, at the southern end of the San Joaquin Valley. The available GIS data indicate the presence of certain types of habitat, and therefore the possible presence of special-status species based on available information. Location-specific data would be needed to make more precise determinations.

Figures 3.15-3a, 3.15-3b, 3.15-4a, and 3.15-4b show the general locations of habitat and wetlands in the Sacramento to Bakersfield region. As illustrated in these figures, possible improvements to multiple highway facilities (SR-99 and I-5) are included as part of the Modal Alternative, whereas a single general alignment option with some variations is proposed for this region as part of the HST Alternative.

Modal Alternative

The Modal Alternative would result in potential impacts on about 800 ac (323.7 ha) of special status species habitat, with a large number of impacts between Sacramento and Stockton. The Modal Alternative would potentially impact more than 50 ac (20.2 ha) of wetlands in the region. Potential impacts on other waters would vary across the region, ranging from low to high impacts (59,329 ac [24,010 ha]), with the highest number of acres potentially impacted (5,500 ac [2,226 ha]) in the Sacramento to Stockton part of the region.

The Modal Alternative would result in potential impacts on fish resources between Sacramento and Fresno during construction because of the need to cross streams and rivers. From Sacramento to Stockton and Merced to Fresno, the Modal Alternative would potentially result in a high incidence of impacts on threatened and endangered species (including blue oak woodland). Potential impacts may result to San Joaquin kit fox habitat between Tulare and Bakersfield. In this region the Modal Alternative would have the potential to result in a high incidence of impacts on wildlife habitats and of disturbance to wildlife movement corridors.

High-Speed Train Alternative

The HST Alternative would pass largely through agricultural lands in this region and would affect few areas of threatened and endangered species, except in the southern portion of the region from Fresno to Bakersfield (San Joaquin kit fox). Similar to the Modal Alternative, the proposed HST Alternative would result in potential impacts on fish resources during construction between Sacramento and Fresno because of the number of streams and rivers the alignment options would cross.

High-Speed Train Alignment Option Comparisons

Within the HST alignment segment from Sacramento to Stockton, the data show the possibility of more potential disturbances to biological resources along the Union Pacific Railroad (UPRR) than along the Central California Traction Company (CCT) route. Because of its proximity to the confluence of the Sacramento and American Rivers, the downtown Sacramento Valley station site may have impacts on biological resources. From Stockton to Modesto, the incidence of potential impacts on biological resources would not differ significantly for the two HST options, except that the UPRR/Modesto Downtown station option would potentially impact about twice as much

wetland acreage as the BNSF/Modesto Briggsmore option. However, fewer potential impacts on wetlands would be expected under the proposed HST Alternative than the Modal Alternative.

At a program level of detail, the technical analysis of these options showed slightly higher potential impacts to biological and water resources for the UPRR alignment as compared to the CCT alignment. However most of the stream crossings under the UPRR alignment are canal crossings, not river crossings, and are generally smaller than the water crossings anticipated for the CCT alignment. The UPRR alignment would have 34 - 88 acres less potential impacts to floodplains than the CCT alignment.

Although the program-level analysis utilizing the sightings reported in the California Natural Diversity Database (NDDDB) indicates that the UPRR alignment has the potential to affect 25 acres more of wildlife habitat and 20 more sensitive species, this information was not confirmed by biological surveys. Recent field observations indicate more vegetation and higher habitat values along the out of service CCT alignment for habitat associated with both the aquatic ecosystem and upland resources than those observed along the UPRR alignment [Derek Jansen, Wildlife Biologist, Jones & Stokes; field observations June 21, 2005]. It was observed that the out of service CCT alignment currently has greater breeding and nesting areas, escape cover, travel corridors, and preferred food sources for resident and transient wildlife species associated with the aquatic ecosystem, as well as upland habitats. It is expected that introduction of the HST service on the CCT right-of-way would result in greater adverse environmental consequences related to interference of wildlife movement and would have more severe impacts to riparian vegetation and habitat values, in comparison with the UPRR alignment, which is a heavily used freight corridor.

The potential for impacts on sensitive plant and animal species for the various HST alignment options between Modesto and Merced would be low. Each of the alignments would potentially result in similar impacts on wetlands, except the BNSF/Merced Municipal Airport station option would cross substantially more acres of wetlands than the other option. The Merced Downtown station option would have a low potential for impacts on wetlands, while the potential for impacts at the airport site would be high.

From Merced to Fresno, the UPRR option would encounter fewer wetlands and sensitive habitats than the BNSF option. From Fresno to Tulare, the BNSF option with a high-speed loop around Fresno would have the potential to result in impacts on the highest number of threatened and endangered species; the HST loop west of Fresno would generally increase the number of potential impacts on biological resources over the route through Fresno. The BNSF/Hanford station option would potentially have fewer impacts on biological resources than the UPRR/Visalia Airport station option due to the greater presence of wildlife habitats, wetlands, and waters along the UPRR.

The technical analysis of these options showed slightly higher potential impacts to biological resources for the BNSF alignment as compared to the UPRR alignment. However, at a program level of detail, these results do not indicate a significant difference between these two HST alignment options that are over 67-miles long. The BNSF option was determined to have 1.4 acres more potential impacts to wetlands and 9 acres more potential impacts to habitat, and 4 more potential sensitive species than the UPRR alignment. In addition, the UPRR has greater potential impacts to the San Joaquin kit fox, with 25 records identified for the UPRR as compared with only 2 – 5 occurrence records for the BNSF.

The technical analysis resulted in differences between the BNSF and UP alignments in regards to the potential impacts to biological and water resources. However, these results do not indicate a significant difference between the BNSF and UP alignment options that vary between 106 to 111

miles in length. The program-level analysis, utilizing the sightings reported in the CNDDDB, indicates that the BNSF alignment is considered San Joaquin kit fox habitat, while the UPRR alignment is not described as habitat. However, this information was not confirmed by biological surveys and appears to be a mapping anomaly of the CNDDDB. The habitat indicators for kit fox in the Bakersfield area include annual grassland and salt scrub vegetation within ruderal open space areas [Steve Avery, senior wildlife biologist and San Joaquin kit fox expert, Jones & Stokes]. There is no indication that these habitat indicators differ within the two alignments [Steve Avery]. In addition, the entire area encompassing both alignments is considered habitat for the San Joaquin kit fox according to USFWS [Kit Fox Habitat coverage information provided to FRA on January, 2005; Cheryl Hickman, USFWS]. Therefore, the amount of endangered species habitat affected by the alignments is considered equivalent, with no difference between the two alignments on effects to endangered species.

C. BAKERSFIELD TO LOS ANGELES

Figures 3.15-5 and 3.15-6 show the general locations of sensitive habitat and wetlands in the Bakersfield to Los Angeles region in relationship to Modal Alternative corridors and alignments for the HST Alternative.

The Modal and HST Alternatives would potentially impact a similar number of wildlife movement/migration corridors in this area. Based on a general assessment of the potential magnitude of the possible impacts, while taking into consideration the relative sensitivity of the resources potentially affected and expected mitigation requirements, the Modal Alternative would have the potential to impact a greater number of sensitive biological resources than the HST Alternative. However, because the HST Alternative would traverse more undeveloped (and possibly more unsurveyed) areas than the Modal Alternative, once the project-level analysis is completed and field surveys of resources are performed, it is possible that the HST Alternative could impact a larger number of special-status species and habitat than has been estimated in this document. The potential to use tunneling and elevated structures and special construction techniques to reduce or avoid impacts of the HST Alternative would be included in the design for the project, should a decision be made to proceed to the next phase of analysis.

Modal Alternative

Implementation of the Modal Alternative would potentially result in impacts on about 140 ac (56.7 ha) of special status species habitat, 10 sensitive species, five wildlife movement/migration corridors, 6.5 ac (2.6 ha) of jurisdictional wetlands, and marine/anadromous fish resources at the Santa Clara River. Most of these impacts would result from the widening of I-5 from SR-99 to SR-14, and of SR-14 from Palmdale to I-5. Extensive cut and fill would be required for the Modal Alternative along I-5 in the Grapevine mountain crossing where biological and wetland resources are shown in existing data sources.

It is expected that the Modal Alternative would result in potential impacts on sensitive biological resources primarily as direct and indirect impacts during construction. Operational impacts are expected to be minor in comparison to construction impacts and would likely consist of indirect impacts such as dust; the introduction and spread of nonnative, invasive plants; stormwater runoff; siltation; and erosion.

High-Speed Train Alternative

Implementation of the proposed HST Alternative would potentially result in impacts on special status species habitat (between 154 ac [62.3 ha] and 238 ac [96.3 ha]), 12 to 14 sensitive species, five wildlife movement/migration corridors, between 2 ac (0.8 ha) and 14 ac (5.7 ha) of wetlands, and marine/anadromous fish resources at the Santa Clara River. Most of these impacts

would occur in the I-5 and SR-58/Soledad Canyon corridors. The MTA/Metrolink and combined I-5/Metrolink options would not impact any sensitive biological resources.

High-Speed Train Alignment Option Comparisons

The Bakersfield to Sylmar segment of the HST includes two routing options: 1) the I-5/Grapevine route (either the Union Avenue or Wheeler Ridge corridor and the I-5 Tehachapi corridor); and 2) the SR-58/Soledad Canyon route (the SR-58 corridor, Antelope Valley corridor, Palmdale station site, and Soledad Canyon corridor). The I-5 route would have the potential to impact slightly more sensitive plant communities, wetlands, and non-wetland waters than the SR-58/Soledad Canyon route. The SR-58/Soledad Canyon route would potentially impact more sensitive plant and wildlife species and more wildlife movement/migration corridors than the I-5 route. Overall, however, there would be a slightly greater potential for impacts on biological resources for the SR-58/Soledad Canyon route than for the I-5 route.

The sensitive plant and wildlife species that would potentially be impacted by the SR-58/Soledad Canyon route are expected to be greater than those for the species that would potentially be impacted by the I-5 route, including potential impacts to desert tortoise habitat. In addition, a greater proportion of the I-5 route would be in tunnels or on an elevated structure, which would reduce potential impacts on sensitive biological resources. Tunneling and elevated structure construction types could avoid potential impacts on wildlife movement/migration corridors along the I-5 route. In contrast, there would be very limited sections of tunnel and elevated structure along the SR-58/Soledad Canyon route, particularly where this route parallels the Santa Clara River. Potential impacts on sensitive plants and wildlife, as well as on major wildlife movement/migration corridors, would therefore be expected to be greater due to the use of cut-and-fill construction techniques. Additional tunneling in Soledad Canyon would reduce potential impacts on sensitive biological resources.

The Sylmar to Los Angeles segment of the HST includes two routing options: 1) the combined I-5/UPRR route; and 2) the MTA/Metrolink route. There are also a number of options on the approach to LAUS.

The I-5 route would have the potential to impact slightly more biological resources than the MTA/Metrolink route. The I-5 route could potentially impact one sensitive plant community, whereas the MTA/Metrolink route would not impact any. The I-5 route would also potentially encounter more water resources than the MTA/Metrolink route.

The LAUS approach options would potentially impact non-wetland waters. The LAUS east bank north/LAUS east bank siding option could potentially impact more waters than the LAUS south siding or the LAUS existing siding option. The LAUS existing south/south connection could potentially impact more waters than the LAUS existing east/east connection.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Both the Modal and HST Alternatives potentially would impact biological resources in the study area in this region. However, when considering biological resources across the region, there are not significant differences among the alternatives and alignment options. Potential advantages in one resource area may be accompanied by potentially higher impacts in other resource areas.

In this region, the Modal Alternative would potentially impact approximately 152 ac (61.5 ha) of special status species habitat compared to between 188 ac (76.1 ha) and 266 ac (107.6 ha) for the HST alternative, and an estimated 2.1 ac (0.8 ha) of wetlands compared to between 1.5 ac (0.6 ha) and 5.3 ac (2.1 ha) for the HST. For special-status species, the Modal Alternative would potentially affect 19 species, and the HST Alternative would potentially affect between 20 and 26 species.

Figures 3.15-7 and 3.15-8 show the general locations of habitat and wetlands in the Los Angeles to San Diego region.

Potential wetland impacts for the HST Alternative include impacts on vernal pools along the alignment from Mira Mesa to San Diego, and impacts on the San Dieguito wetlands. The HST Alternative would also result in potential impacts on a number of federally listed wildlife species. The Los Peñasquitos Canyon Preserve near MCAS Miramar provides a significant regional wildlife corridor that could be impacted by the HST Alternative.

In the Los Angeles to March ARB segment, the Modal and HST Alternatives would potentially result in similar levels of potential impacts on biological resources. Both alternatives would result in potential impacts on wildlife habitat and wildlife movement corridors, and both alternatives would be expected to encounter threatened and endangered species as well as sensitive vegetation and non-wetland waters. Because of the more urbanized character of the I-10 corridor compared to the UPRR/Colton or UPRR/Riverside rail corridors, the Modal Alternative would result in slightly fewer potential impacts than the HST Alternative alignments in this segment. However, the potential Modal Alternative impacts along the I-15 freeway corridor would be avoided by the HST Alternative because it would follow the San Jacinto Line (near the I-215 freeway corridor).

In the March ARB to Mira Mesa segment, the Modal and HST Alternatives would result in a similar level of potential impacts on biological resources. Both alternatives would result in potential impacts on wildlife habitat and movement corridors and encounter threatened and endangered species. Both alternatives would encounter similar amounts of sensitive vegetation and potentially would result in impacts on non-wetland waters along the I-215 corridor between March ARB and the I-15/I-215 split at Temecula. Both alternatives would have the same potential impacts along the I-15 corridor between the I-15/I-215 split and Mira Mesa. However, the HST Alternative would avoid the potential Modal Alternative impacts along the I-15 corridor north of the I-15/I-215 split at Temecula because the HST alignment would follow the I-215 corridor north of the split rather than the I-15 corridor in this segment.

In the Mira Mesa to San Diego segment, the Modal and HST Alternatives would result in a similar level of potential impacts on biological resources. Both alternatives would potentially result in impacts on wildlife habitat and movement corridors and would potentially encounter threatened and endangered species. The Modal Alternative and the three HST alignment options that follow the I-15 to Qualcomm Stadium would be expected to encounter similar amounts of sensitive vegetation and would potentially result in impacts on non-wetland waters along the I-15 corridor between Mira Mesa and I-8. Although the other two HST alignment options would depart from the I-15 corridor, they still potentially would encounter sensitive biological resources, passing through undeveloped areas to the coast and then south along the existing rail corridor to downtown San Diego. The HST Alternative would avoid the potential Modal Alternative impacts along the SR-163 freeway corridor.

Modal Alternative

The Modal Alternative would have the potential to result in impacts on more than 152 ac (61.5 ha) of special status species habitat; 19 sensitive species; and 2.1 ac (0.8 ha) of wetlands. The I-15 improvements included in the Modal Alternatives could result in substantial impacts on sensitive vegetation communities and wetlands, including of vernal pools, just north of MCAS Miramar. These wetlands are known to support the California least tern and western snowy plover, both of which are federally listed as endangered.

High-Speed Train Alternative

The HST Alternative would have the potential to impact the following ranges of biological resources, depending on the alignment option.

- Special status species habitat: between 188 ac (76.1 ha) and 266 ac (107.6 ha).
- Wetlands: between 1.5 ac (0.6 ha) and 5.3 ac (2.1 ha).
- Sensitive species (based on habitat types present): between 20 and 26.

High-Speed Train Alignment Option Comparisons

Although some differences have been identified among the HST alignment options, these differences do not clearly indicate that one alignment option compared to the others would potentially result in substantially fewer impacts on biological resources in this region. For example, alignment options that include the San Bernardino loop would result in slightly fewer potential impacts on wetlands and other waters for either of the two mainline HST alignments (UPRR/Colton or UPRR Riverside/UPRR Colton) compared to those not including the loop. The proposed tunneling associated with the Escondido Transit Center alignment option would result in slightly less orchard and vineyard habitat acreage being impacted and fewer potential impacts on water resources compared to the option that adheres to the I-15 corridor. The alignment option serving the Qualcomm Stadium station would result in a slightly higher level of potential impacts on sensitive vegetation, but otherwise would result in potential impacts similar to those for the two alignment options that join the coast and serve the airport and downtown San Diego. Overall, these differences would not readily distinguish the HST alignment options in terms of potential impacts on biological resources.

In the Los Angeles to March ARB segment, the three alignment options would have fairly similar potential impacts on sensitive biological resources. However, there are characteristics that would distinguish these alignments. The UPRR Riverside alignment option would encounter substantially more grassland and potentially impact slightly more water resources than the two UPRR Colton alignment options. The San Bernardino loop option (an option to both the UPRR Colton and UPRR Riverside alignments) would reduce the amount of potentially impacted waters and wetlands.

The University of California, Riverside station potentially would encounter wildlife habitat, threatened and endangered species, and a substantial amount of non-wetland waters. The Colton station site potentially would result in impacts on both categories of protected species and non-wetland waters. The El Monte station site potentially would result in impacts on species of special concern. The South El Monte station potentially would impact non-wetland waters. Otherwise, the stations in this segment would not be expected to encounter sensitive biological resources.

In the March ARB to Mira Mesa segment, the two alignment options would result in virtually identical potential impacts, except for a slight difference in the amount of orchards and vineyard habitat potentially affected, and a slightly lower acreage of non-wetland waters potentially impacted by the alignment option that would serve the Escondido Transit Center station. The difference is because this alignment option would depart the I-15 freeway corridor and pass through the more urbanized central portion of Escondido to serve the Escondido Transit Center station. This diversion would avoid a portion of the sensitive biological resources that would be potentially be affected by the other alignment option.

The March ARB station site potentially would impact threatened and endangered species as well as coastal sage scrub. The Escondido station potentially would impact species of special concern. The Murrieta at I-15/I-215 station potentially would impact a substantial amount of non-wetland waters. Otherwise, the stations in this segment would not be expected to encounter sensitive biological resources.

In the Mira Mesa to San Diego segment, the three alignment options would be expected to result in potential impacts on wildlife habitat and movement corridors and to encounter threatened and endangered species. The types of predominant vegetation and the wetlands potentially encountered would distinguish the three options.

Along the Miramar Road HST alignment option there is a predominance of mixed chaparral and southern riparian scrub, and this option would potentially encounter a substantial amount of non-wetland waters. Estuarine areas along the coast would be the majority of the potentially affected wetlands with some vernal pool wetlands in the interior portion of the segment.

Along the Carroll Canyon HST alignment option there is a predominance of southern riparian scrub, and this option would potentially encounter more non-wetland waters (as a result of the canyon alignment) compared to the other two alignment options. The Carroll Canyon HST alignment traverses areas designated in the city of San Diego's Multiple Habitat Planning Area (MHPA), with potential negative impacts. Potential wetlands impacts would be primarily estuarine along the coast, with a greater amount of vernal pool wetlands compared to the Miramar Road alignment.

Along the Qualcomm Stadium HST alignment option there is a predominance of mixed chaparral, and this option would potentially encounter a substantial amount of non-wetland waters (similar in quantity to the Miramar Road alignment). These would be mostly palustrine and vernal pool wetlands. Previous studies by the U.S. Fish and Wildlife Service concluded that there is a greater quantity of vernal pools along the I-15 corridor than either the Miramar Road or Carroll Canyon alignment.¹²

The Transit Center station site in San Diego would not be expected to result in potential impacts on protected species or wetlands, but it would potentially result in impacts on habitat and movement corridors, as well as potentially encounter southern riparian scrub and non-wetland waters. Potential impacts from the Mira Mesa station would be limited to palustrine and vernal pool wetlands. Three of the station sites—Qualcomm Stadium, San Diego International Airport, and San Diego station at Santa Fe Depot—would potentially result in impacts on threatened and endangered species. Two of the station sites (Qualcomm Stadium and San Diego International Airport) potentially would impact wildlife habitat. In addition to potential species impacts, the San Diego station at Santa Fe Depot would potentially impact estuarine wetlands not found in the other stations in this segment.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

Though potential impacts would vary from segment to segment in this region along the Modal and HST Alternatives, many segments of the Modal Alternative appear to have a higher potential for affecting sensitive biological resources and water resources compared to the HST Alternatives. The proposed rail improvements, are expected to adversely affect fewer sensitive biological resources and waters, because most improvements would be made within an existing rail corridor in which any biological resources present would already have been disturbed. Figures 3.15-9 and 3.15-10 show the general locations of habitat and wetlands in the Los Angeles to San Diego region.

Modal Alternative

As defined, the Modal Alternative would require the acquisition of approximately 1,100 ac (445 ha) of adjacent right-of-way between Los Angeles and San Diego, of which 370 ac (150 ha) would be paved to accommodate the highway and interchange widening proposed under this

¹² U.S. Fish and Wildlife Service, "Vernal Pools of Southern California, Draft Recovery Plan," 1997

alternative.¹³ The additional right-of-way would include approximately 6,066 ac (2,455 ha) of natural vegetation that are found in undeveloped or unimproved open-space areas. Bridges and overpasses would be widened in urban, suburban, coastal, and open-space environments, increasing the footprint of the highway as well as shadow effects beneath the infrastructure. Bridge widening would likely be of most concern in the lagoon areas of northern San Diego County, where the existing bridges impede tidal flow. This impact could be exacerbated if the footprint of the highway bridge were enlarged within the lagoons. The increased pavement across surface waters would increase the amount of urban runoff and could increase the pollutant burden in local rivers, creeks, and lagoons. An estimated 5,224 ac (2,114 ha) of wetlands would potentially be affected by the Modal Alternative, and an estimated 103 special-status species would potentially be affected.

High-Speed Train Alternative

Both the HST alignment options would be located within existing rights-of-way and would need little right-of-way outside of existing rail corridors between LAX and San Diego. Depending on the alignment and construction options for the high-speed rail improvements, new right-of-way would be needed outside existing rail corridors to accommodate proposed curve realignments and improved or new stations along established rail routes.

Alignment Option Comparisons

There is not a major difference in potential impacts between the route along the LOSSAN corridor and the route along the UPRR corridor. While there appear to be more non-wetland waters in the study area of the LOSSAN corridor, most of the waters in this segment are contained within constructed channels in the urban environment. Therefore, no significant difference in potential impacts is indicated between these two potential corridor routes.

3.15.5 Design Practices

The Authority is committed to utilizing existing transportation corridors and rail lines in the proposed high-speed rail system in order to minimize potential impacts to biological resources bisecting sensitive areas. Nearly 70% of the preferred HST Alternative is either within or adjacent to a major existing transportation corridor (existing railroad or highway right-of-way). Use of these existing transportation corridors helps minimize potential impacts since they have already imposed a footprint/barrier along which the HST system would pass where not in a new corridor. Moreover, portions of the system would be on aerial structure or in tunnel, allowing for unhindered crossing of the alignment by wildlife. Only 24% percent of the preferred HST system is at-grade in new corridors (not on aerial structure or in tunnel and not within or adjacent to an existing transportation right-of way). For the HST system, underpasses or overpasses or other appropriate passageways would be designed during project-level for implementation at reasonable intervals during construction to avoid, minimize and/or mitigate any potential impacts to wildlife movement.

The HST system must be fenced when operating at-grade and thus is a barrier to much wildlife (unlike a road where wildlife species cross) and would introduce a new barrier to animal movement where not in tunnel/aerial and where no wildlife crossings are proposed.

Major portions of the potential alignments through undeveloped areas would be in mountainous terrain where the use of tunnels would avoid impacts to biological resources. To avoid or limit potential impacts along the surface above the tunnels, the HST Alternative limits surface access for ventilation and/or evacuation through the use of large diameter tunnels design. The potential impacts associated with

¹³ Acres of right-of-way for the Modal Alternative are estimated based on the need for a minimum of 25 ft (8 m) of additional pavement width and 50 ft (15 m) of unpaved width for drainage, cut and fill, and other unpaved area, for the length of I-5 between Los Angeles and San Diego.

construction access roads would be greatly limited, and avoided altogether in some segments, by using in-line construction, i.e., by using the new rail infrastructure as it is built to transport equipment to and from the construction site and to transport excavated materials away from the construction area and to appropriate re-use (e.g., as fill material, aggregate for new concrete, etc.) or disposal sites. To avoid creating access roads in sensitive areas, necessary geologic exploration would be accomplished using helicopter transport for drilling equipment and site restoration to minimize surface disruption. Small pilot tunnels would be utilized where more extensive subsurface geology information is needed.

The Authority's design practices emphasize the use or reuse of excavated materials within the confines of the project and avoidance or minimization of any additional impact on sensitive areas from placement of excess material. While the specific uses or the quantity of placement of excavation material cannot be determined at the program level of environmental study, they would be addressed during subsequent project-level environmental analysis. The vast majority of the excavated tunneling material is anticipated to be suitable for reuse in the construction of the proposed HST facilities. Potential uses include aggregate for concrete and fill material for other portions of the line. Balancing the earthwork operations will be a key objective in the subsequent project level engineering. The current conceptual HST alignment designs considered in the Program EIR/EIS use the placement of all materials excavated from tunnels to be used as fill material along adjacent HST alignments.

Uses of excavated materials would, in part, be determined by the timing of project construction. At any point in time, various construction projects (with appropriate environmental permits) will require disposal and re-use of fill material. The Authority would coordinate the exchange of such materials with other ongoing projects to the ultimate benefit of each.

3.15.6 Mitigation Strategies and CEQA Significance Conclusions

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for biological resources and wetlands, the proposed HST system alternative is considered to have a significant effect when viewed on a systemwide basis. Placing the conceptual corridors for the HST system alternative largely within or along existing transportation corridors reduces the potential for adverse effects to these resources, and engineering and design practices further reduce potential adverse impacts to these resources (e.g., avoiding encroachments on habitat and wetlands, use of aerial structures or tunnels lined with impermeable surfaces to avoid sensitive areas). However, portions of the HST system would be in new corridors and some biological resources and wetlands will likely be adversely affected should a decision be made to develop the proposed HST system. At the programmatic level of analysis, it is not possible to know precisely the location, extent and particular characteristics of impacts to these resources. Mitigation strategies, as well as the design practices discussed in section 3.15.5, will be applied to reduce these impacts.

Potential strategies to mitigate remaining impacts on biological resources would include: (1) field verification of sensitive resources; (2) filling of data gaps; (3) subsequent project-specific analyses of environmental impacts; (4) consultation with appropriate resource agencies to refine avoidance and mitigation measures, and; (5) developing and adopting a mitigation monitoring program.

To the extent practicable, direct and indirect impacts to biological resources will be avoided by refinements to detailed alignments to be developed during the project-level design and environmental evaluation phase. Further possible mitigation measures for consideration at the project level include: (1) project –design changes, e.g., construction on above-ground structures, in a tunnel, or to reduce the impact footprint; (2) participation in or contribution to existing or proposed conservation banks or natural management areas, including possible acquisition, preservation, or restoration of habitats; (3) relocation of sensitive species; and (4) construction of wildlife underpasses, bridges, and/or large culverts, to facilitate known wildlife movement corridors. Wildlife crossings, such as those constructed for bobcat and

coyote in San Bernardino for a highway project (National Cooperative Highway Research Program 2002), have been shown to be successful.

Specific mitigation measures would be identified at the project level of environmental review. Consultation with the appropriate resource agencies to develop site-specific avoidance and minimization strategies would be incorporated in the project-level environmental review. Special mitigation needs would be considered in the future with the appropriate authorities that are responsible for regional mitigation (conservation) banks, HCPs, NCCPs, or special area management plans. However, providing sufficient mitigation for compliance with CWA requirements for wetlands would likely be difficult and challenging.

Resource agencies have expressed interest in helping to develop and participate in a mitigation planning and monitoring program to determine impacts and mitigation effectiveness for sensitive species in the lagoon areas. This approach could include site-specific baseline conditions, monitoring mitigation effectiveness as various proposed projects (highway and rail) are constructed, and adjusting mitigation measures as needed based on effectiveness and compatibility with lagoon restoration programs.

Because specific biological resource impacts cannot be predicted with certainty at this program level, specific mitigation measures also cannot be developed at this time. However, mitigation strategies are described below from which specific mitigation measures can be developed once the extent of direct and indirect biological resource impacts have been determined at the project level.

Mitigation strategies that could be applied at the project level for potential impacts to biological resources include the following:

- Plant communities: consideration of construction monitoring, on- and/or off-site revegetation/restoration, purchase of credits from an existing mitigation bank. Mitigation ratios would vary depending on the quality of the plant community impacted and whether or not it provides habitat for sensitive plant or wildlife species. Regulatory agencies would be consulted to determine appropriate mitigation ratios. On-site mitigation would be preferred to off-site mitigation whenever possible. Off-site mitigation should be located within the same watershed or in close proximity to the impact area, where feasible.
- Biological Resources Management Plans (BRMP) would be prepared to specify the design and implementation of biological resources mitigation measures, including habitat replacement and revegetation, protection during construction, performance (growth) standards, maintenance criteria, and monitoring requirements. The USFWS, CDFG, and USACE would review Draft BRMP's.

The primary goal of a BRMP is to ensure the long-term perpetuation of the existing diversity of habitats in the project area and adjacent urban interface zones. BRMP's shall contain the following:

- a. Specific measures for the protection of sensitive amphibian, mammal, bird, and plant species during construction.
- b. Identification and quantification of habitats to be removed, along with the locations where these habitats are to be restored or relocated.
- c. Procedures for vegetation analyses of adjacent protected habitats to approximate their relative composition, site preparation (clearing, grading, weed eradication, soil amendment, topsoil storage), irrigation, planting (container plantings, seeding), and maintenance (weed control, irrigation system checks, replanting). This information would be used to determine the requirements of the revegetation areas.
- d. Sources of plant materials and methods of propagation.

- e. Specific parameters for the determination of the amount of replacement habitat for temporary disturbance areas.
 - f. Specification of parameters for maintenance and monitoring of re-established habitats, including weed control measures, frequency of field checks, and monitoring reports for temporary disturbance areas.
 - g. Specification of performance standards for growth of re-established plant communities and cut-and-fill slopes.
 - h. Remedial measures to be taken if performance standards are not met.
 - i. Methodologies and requirements for monitoring of the restoration/replacement efforts.
 - j. Measures to preserve topsoil and control erosion control.
 - k. Design of protective fencing around Environmentally Sensitive Areas (ESAs) and the construction staging areas.
 - l. Specification of location and quantities of gallinaceous guzzlers (catch basin/artificial watering structures, if needed); specification of monitoring of water levels in guzzlers.
 - m. Location of trees to be protected as wildlife habitat (roosting sites) and locations for planting of replacement trees.
 - n. Specification of the purpose, type, frequency, and extent of chemical use for insect and disease control operations as part of vegetative maintenance within sensitive habitat areas.
 - o. Specific construction monitoring programs for sensitive species.
 - p. Specific measures for the protection of sensitive habitats to be preserved. These measures may include, but are not limited to, erosion and siltation control measures, protective fencing guidelines, dust control measures, grading techniques, construction area limits, and biological monitoring requirements.
 - q. Provisions for biological monitoring during construction activities to ensure compliance and success of protective measures. The monitoring procedures would (1) identify specific locations of wildlife habitat and sensitive species to be monitored; (2) identify the frequency of monitoring, monitoring methodology (for each habitat and sensitive species to be monitored); (3) list required qualifications of biological monitor(s); and (4) identify reporting requirements.
- Sensitive plant species: pre-construction focused surveys, construction monitoring, relocation of plants, seed collection, plant propagation, and outplanting to a suitable mitigation site, participation in an existing HCP. Prior to construction, focused surveys should be conducted for sensitive plant species identified as occurring in the study area. Locations of sensitive plant species observed should be mapped on construction drawings. Research must be conducted on appropriate methods to use on a species-by-species basis. Some plant species may require transplantation, whereas others may germinate from seed, and still others may need to be propagated in a greenhouse prior to planting on an appropriate mitigation site. Also, see reference to BRMP, above.
 - Specific mitigation measures would be developed to minimize or avoid the spread of weeds during construction and operation. Preventive measures during construction could include identification of areas with existing weed problems and measures to control traffic moving out of those areas (e.g. cleaning of construction vehicles, limitations on movement of fill). Mitigation for operational impacts would also be developed.

- Sensitive wildlife species: pre-construction focused surveys, construction monitoring, restoration of suitable breeding and foraging habitat, purchase of credits from an existing mitigation bank, participation in an existing HCP. Prior to construction, focused surveys should be conducted for sensitive wildlife species identified as occurring in the study area. Locations of sensitive wildlife species observed should be mapped on construction drawings. Construction could be phased around the breeding season for sensitive wildlife species. Also, see reference to BRMP, above.
- Wildlife movement/migration corridors: Wildlife crossings would be of a design, shape and size to be sufficiently attractive to encourage wildlife use. Overcrossings and undercrossings for wildlife would be appropriately vegetated to afford cover and other species requirements. Functional corridors would be established to provide connectivity to protected land zoned for uses that provide wildlife permeability. The following process would be used in design of corridors:
 - Identify the habitat areas the corridor is designed to connect
 - Select several species of interest from the species present in these areas
 - Evaluate the relevant needs of each selected species
 - For each potential corridor, evaluate how the area will accommodate movement by each species of interest
 - Draw the corridors on a map
 - Design a monitoring program
- Jurisdictional waters and wetlands: The amount of mitigation required would be assessed on an acreage basis, with ratios depending upon the nature and condition of the jurisdictional areas located within the impact areas. When appropriate, on-site mitigation would be preferred. Off-site mitigation should be located within the same watershed or as close in proximity to the area of impact as possible. Mitigation options for unavoidable impacts to state and federal jurisdictional waters would include on- or off-site restoration, creation, or enhancement, mitigation banking, or in-lieu fee payments, as described below.
 - Restoration – Return degraded habitat to a pre-existing condition.
 - Creation – Conversion of a persistent non-wetland habitat into wetland (or other aquatic) habitat. The created habitat may be self-sustaining or dependent upon artificial irrigation.
 - Enhancement – Increase one or more functions through activities, such as plantings or non-native vegetation eradication.
 - Passive Revegetation – Allow a disturbed area to naturally revegetate without plantings.
 - Mitigation banking - Purchase of units of wetland or waters habitat that have been restored or enhanced within a larger managed conservation area. The units are typically known as "credits" and are usually sold on an acreage basis.
 - In-Lieu Fee Program – A monetary payment is made to an agency approved entity that provides habitat conservation or restoration. For instance, the Nature Conservancy may receive in-lieu fee payments for impacts in all watersheds. And the Santa Monica Mountains In-Lieu Fee Program is available for impacts to waters within Los Angeles County.
 - Current federal and state policy emphasizes a "no net loss" of wetlands habitats policy, which is usually achieved through restoration of areas subject to temporary impacts or creation of wetlands to offset permanent impacts. However, the January 27, 2003, Special Public Notice for Mitigation and Monitoring Guidelines states that the USACE favors the use of approved

mitigation banks or in-lieu fee programs in cases where they result in more regional or watershed benefit than on-site compensatory mitigation. Approved mitigation and in-lieu fee programs would include measures that ensure the no net loss of wetlands policy is met.

The above mitigation strategies, which include further study to obtain additional data and to refine site-specific mitigation measures, are expected to substantially lessen or avoid impacts to biological resources and wetlands. With the second-tier, project-level review and as a result of consultations with wildlife agencies and obtaining required permits for segments of the HST system facilities, and complying with permit terms and conditions, impacts to biological resources and wetlands will be reduced. Sufficient information is not available at the program level to conclude with certainty that mitigation will reduce impacts to affected resources to a less than significant level in all circumstances. Therefore, impacts to biological resources and wetlands are considered significant at the program level even with the application of mitigation strategies. Additional environmental assessment will allow more precise evaluation in the second-tier, project-level environmental analyses.

3.15.7 Subsequent Analysis

Identification of potential impacts on various biological resources for this Program EIR/EIS has primarily relied on the available GIS database, other GIS tools, and review of available literature. These sources encompass a broad range of information that may not exactly correspond to actual field conditions. Project-level studies would be required to obtain more reliable assessments of potential impacts on biological resources in the study area.

The subsequent biological resources analyses required for project environmental documentation would focus on project-specific impacts that reflect more precise definitions of the right-of-way, the proposed facility locations, and the operations. Areas of possible further study include the following.

- Field surveys to determine the extent and type of general and sensitive biological resources, including focused surveys following resource agency protocols for special-status species.
- Mapping of plant communities and sensitive biological resources within and adjacent to the proposed HST system right-of-way/impact footprint to address direct and indirect impacts on biological resources.
- Study of wildlife movement/migration corridors. Major wildlife movement/migration corridors within the study area have been identified. Field studies could identify additional locally significant corridors and provide data to assist in the design of bridges and wildlife crossings at crucial travel route points.
- Delineation of waters and wetlands to determine the extent of USACE and CDFG jurisdiction, and consultation conducted with these agencies regarding appropriate mitigation.
- Hydraulic analysis of lagoon crossings to identify potentially feasible improvements that may help improve tidal hydraulics and remove barriers to floodwaters.
- Consultation with USFWS, as needed, for potential impacts on federally listed plant and wildlife species, including the preparation of a biological assessment or assessments, and biological opinions for each phase of project implementation. Early consultation would help to refine appropriate mitigation strategies. Upon project level initiation of Section 7 consultation, for project study areas the FRA and the Authority would in principle accomplish the steps identified by DOI by: 1) identifying the conservation needs of each listed species with the potential to be impacted by the proposal; 2) identifying the threats to each listed species' conservation related to the proposed action; 3) identifying species conservation or management units and the threats affecting those units; 4) identifying species' conservation goals framed within the context of the HST program; and 5) developing conservation/management unit strategies. The FRA and the Authority would prepare Biological Assessments to address the affected conservation/management units identified.

- Consultation with CDFG regarding potential impacts on state-listed plant and wildlife species and appropriate mitigation for such impacts. Early consultation would help to refine appropriate mitigation strategies.
- Assessment of potential for participation in HCPs.
- Development of a mitigation monitoring plan for environmental compliance during construction.
- Application for necessary permits (USACE Nationwide Permit or Section 404, USFWS Biological Opinion, CDFG consistency determination with USFWS Biological Opinion, and 1600 Streambed Alteration Agreement, RWQCB Section 401).

3.16 SECTION 4(f) AND 6(f) RESOURCES (PUBLIC PARKS AND RECREATION, WATERFOWL REFUGES AND HISTORIC SITES)

Section 4(f) and 6(f) resources analyzed in this Program EIR/EIS include publicly owned parklands, recreation lands, wildlife and waterfowl refuges, and historic sites that are covered by Section 4(f) of the Department of Transportation (DOT) Act of 1966 and Section 6(f) of the Land and Water Conservation Fund Act of 1965. This section describes the existing Section 4(f) and 6(f) resources within the five project regions and identifies the potential uses of and potential impacts on Section 4(f) and 6(f) resources for each alternative. Since this is a program-level environmental document, the uses of and impacts on Section 4(f) and 6(f) resources are analyzed at a program level.

3.16.1 Regulatory Requirements and Methods of Evaluation

A. REGULATORY REQUIREMENTS

Section 4(f)

Section 4(f) of DOT Act of 1966 (49 U.S.C. § 303) states the following.

- (a) It is the policy of the United States government that special effort be made to preserve the natural beauty of the countryside and public park and recreation lands, wildlife and waterfowl refuges, and historic sites.
- (b) The Secretary of Transportation shall cooperate and consult with the Secretaries of the Interior, Housing and Urban Development, and Agriculture, and with the states, in developing transportation plans and programs that include measures to maintain or enhance the natural beauty of lands crossed by transportation activities or facilities.
- (c) The Secretary may approve a transportation program or project (other than any project for a park road or roadway under Section 204 of Title 23) requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local officials; or land of an historic site of national, state, or local significance (as determined by the federal, state, or local officials having jurisdiction over the park, area refuge, or site) only if,
 - (1) there is no prudent and feasible alternative to using that land; and
 - (2) the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use.

Similarly, California law requires a state agency that proposes a project which may result in adverse effects on historical resources listed or eligible for listing in the National Register of Historic Places (NHRP) or the California Register of Historical Resources (CRHR) to consult with the State Historic Preservation Office and to identify feasible and prudent measures that will eliminate or mitigate the adverse effects (California Public Resources Code §§ 5024 and 5024.5; CEQA Guidelines § 15064.5.)

Section 6(f)

State and local governments often obtain grants through the Land and Water Conservation Fund Act to acquire or make improvements to parks and recreation areas (16 U.S.C. §§ 460-4 through 460-11, September 3, 1964, as amended 1965, 1968, 1970, 1972–1974, 1976–1981, 1983, 1986, 1987, 1990, 1991, 1993–1996). Section 6(f) of the act prohibits the conversion to a non-recreational purpose of property acquired or developed with these grants without the approval of the U.S. Department of the Interior's (DOI's) National Park Service. Section 6(f) directs DOI to ensure that replacement lands of equal value (monetary), location, and usefulness are provided

as conditions to such conversions. Consequently, where such conversions of Section 6(f) lands are proposed for transportation projects, replacement lands must be provided.

California statutes similarly require replacement lands. The California Public Park Preservation Act of 1971 (California Public Resources Code § 5400 *et seq.*) provides that a public agency that acquires public parkland for non-park use must either pay compensation that is sufficient to acquire substantially equivalent substitute parkland or provide substitute parkland of comparable characteristics.

B. METHOD OF EVALUATION OF IMPACTS

This evaluation of potential impacts on Section 4(f) and 6(f) resources focuses on identifying uses of and historical, cultural, parkland, and wildlife resources under existing conditions, and potential uses of and impacts on these resources under the No Project, Modal, and High-Speed Train (HST) Alternatives. For this program document, the primary goal of the analysis was the identification of Section 4(f) and 6(f) resources on or very close to the proposed HST and Modal Alternative alignment options and the relative potential impacts of the alternatives on these resources. At this stage, it is not practical to study and measure the severity of each potential impact identified. No fieldwork was conducted as part of this analysis. In subsequent project-level analysis, should a decision be made to proceed with the HST Alternative, Section 4(f) and 6(f) resources, potential uses and impacts, and appropriate mitigation measures would be identified in detail.

Various sources were consulted to identify potential resources in each region, including available databases, studies, and other documents. These documents are listed in the references chapter of this document. To identify and quantify the potential impacts by resource type, the improvements included under each alternative (highway and rail alignments, rail stations, and airports) were overlaid on available databases and maps.

Two types of potential impacts on Section 4(f) and 6(f) resources were identified: direct and proximity.

- **Direct Impact:** A physical feature of a proposed improvement would be within 150 feet from centerline and could directly intersect with a portion or all of the resource and require the use of property from that resource.
- **Proximity Impact:** A physical feature of a proposed improvement has the potential to impact the resource as a result of its proximity to the resource.

Potential impacts were assigned a qualitative ranking of high, medium, or low based on the proximity of the resource to the centerline of the proposed improvement. The rankings are summarized in Table 3.16-1.

Table 3.16-1
Rankings for Potential Direct and Proximity Impacts
on Section 4(f) and 6(f) Resources

Ranking	Distance of Resource from Centerline	Potential Impact
High	0 to 150 ft (0 to 46 m)	Direct
Medium	150 to 450 ft (46 to 137 m)	Proximity
Low	450 to 900 ft (137 to 274 m)	Proximity

3.16.2 Affected Environment

A. STUDY AREA DEFINED

The study area for the analysis of Section 4(f) and 6(f) resources encompasses the area within 900 ft (274 m) on either side of the centerline of each alignment, and within a 900-ft (274-m) radius of the stations for each alternative.

Because the proposed HST system would cross urbanized and developed areas, a variety of Section 4(f) and 6(f) resources could be affected. The proposed HST system alignment options were developed with the intent of avoiding these resources to the extent feasible. There are potential locations within the proposed HST system, however, where Section 4(f) and 6(f) resources would not be avoided. These are discussed in the environmental consequences section below.

B. GENERAL DESCRIPTION OF SECTION 4(f) AND 6(f) RESOURCES

Section 4(f) and 6(f) resources refer to publicly owned lands of a park, recreation area, or wildlife and waterfowl refuge; or land of a historical site of national, state, or local significance (as determined by the federal, state, regional, or local officials having jurisdiction over the park, recreation area, refuge, or site).

Historically, urban and suburban development follows the establishment of transportation corridors and facilities. In California in the late 19th and early 20th centuries, most cities formed around ports and rail lines, the primary modes for transporting people and goods. After World War II, in the early 1950s, highways and the automobile became the dominant mode of transportation, bringing urban and suburban development to areas along highways that were formerly farm-to-market roads connecting rural areas to cities.

The location and identification of Section 4(f) and 6(f) resources reflect this historic transportation corridor and urban development pattern. Today, in the urban areas that developed around the railroads at the turn of the century, there is a high concentration of historical resources. In many California cities, the railroad station is one of the oldest historical resources in the city. In the suburban and rural areas where development followed highways, some open space and natural areas have been preserved as public parks. In addition to these passive park¹ areas, new public parks and playgrounds have been built as part of residential developments. All of these historical resources and public parks are considered potential Section 4(f) and 6(f) resources. Therefore, in urban regions an alternative would be more likely to affect historical and archeological resources, while in suburban, wilderness, or remote areas (e.g., mountain crossings), an alternative would be more likely to affect public parks and recreation lands, and wildlife and waterfowl refuges.

C. SECTION 4(f) AND 6(f) RESOURCES BY REGION

The most significant Section 4(f) and 6(f) resources in each region (except historical and archaeological resources) are identified below. (See Section 3.12, *Cultural and Paleontological Resources*, for an analysis of historical and archeological resources.)

Bay Area to Merced

This region includes central California from the San Francisco Bay Area (San Francisco and Oakland) south to the Santa Clara Valley and east across the Diablo Range to the Central Valley. The Bay Area to Merced region contains a wide variety of Section 4(f) and 6(f) resources, including one prominent national wildlife refuge (Don Edwards San Francisco Bay National

¹ *Passive park* refers to a park that is used for picnicking or passive water sports; it also describes zoos and arboretums. An *active park* is a park that includes facilities such as children's play equipment, playing fields, tennis or basketball courts, etc.

Wildlife Refuge), one prominent state park (Henry W. Coe State Park), and many local parks. Historic downtown districts in Oakland and historic rail stations in San Jose, Santa Clara, and Gilroy typify many of the historical resources that can be found throughout the region. Key resources are shown in Figure 3.16-1.

Sacramento to Bakersfield

This region of central California includes a large portion of the Central Valley (San Joaquin Valley) from Sacramento south to Bakersfield. Resources in this region include large parks, such as Stone Lakes National Wildlife Refuge in Sacramento County and Pixley National Wildlife Refuge in Tulare County, as well as smaller state and local (city and county) parks, including Colonel Allensworth State Historical Park and the American River Parkway. In addition, there are historic properties in downtown Sacramento and in the small, older cities of the Central Valley.

Bakersfield to Los Angeles

This region of southern California encompasses the southern portion of the Central Valley south of Bakersfield, the mountainous areas between the Central Valley and the Los Angeles basin, and the northern portion of the Los Angeles basin from Sylmar to downtown Los Angeles. Federal, state, local, and regional Section 4(f) and 6(f) resources in this region include Fort Tejon Historical Park, Angeles National Forest, Griffith Park, and Vasquez Rocks County Park. The region also contains a large number of smaller county and city recreation resources, including active, passive, and wilderness parks. Most of the historic properties in this region are within the urban areas of Los Angeles County. Key resources are shown in Figure 3.16-2.

Los Angeles to San Diego via Inland Empire

This region of southern California includes the eastern portion of the Los Angeles basin from downtown Los Angeles east to the Riverside and San Bernardino areas, and south to San Diego generally along the I-215 and I-15 corridors. Local and regional parks dominate the Section 4(f) and 6(f) resources of this region. There are many local parks in this region, largely because suburban communities developed small neighborhood parks with schools around the highway and rail alignments. Federal and regional resources identified in this area include the Riverside National Cemetery, Cleveland National Forest, Santa Margarita Ecological Reserve, and Old Town San Diego State Historic Park.

Los Angeles to San Diego via Orange County

This region includes the western portion of the Los Angeles basin between downtown Los Angeles and Los Angeles International Airport (LAX) and the coastal areas of southern California between Los Angeles and San Diego, generally following the existing Los Angeles to San Diego via Orange County I-5 highway corridor. Similar to the Inland Empire area discussed above, the Los Angeles to San Diego via Orange County corridor Section 4(f) and 6(f) resources are predominantly local parks. This region includes older coastal cities, however, and several areas have a high number of historic properties listed on the NRHP and the CRHR.

3.16.3 Environmental Consequences

The identification of Section 4(f) and 6(f) resources could result in significant differences among the alignment options, and between the Modal and HST Alternatives, because of the potential disruptions and costs associated with the avoidance, minimization, and possible need to mitigate impacts on such resources. These potential impacts could range from temporary construction impacts to the acquisition² of Section 4(f) and 6(f) resources.

² In this context, *acquisition* means that a Section 4(f) or 6(f) resource would be directly affected by the proposed project, and the value of the resource or a portion thereof would be lost as a result of the project.

A. EXISTING CONDITIONS COMPARED TO NO PROJECT ALTERNATIVE

The existing conditions are based on transportation infrastructure that was identified as part of the alternatives definition process. The No Project Alternative is based on existing conditions and the funded and programmed transportation improvements that are projected to be developed and in operation by 2020. It is not possible as part of this study to identify or quantify the potential uses and impacts expected to occur by 2020 with implementation of the No Project Alternative. Rather, it is assumed that the improvements to be developed and implemented under the No Project Alternative would undergo typical design and construction practices that would avoid or greatly limit potential impacts. Additionally, each improvement associated with the No Project Alternative will be subject to a project-level environmental document that will identify potential uses and impacts, as well as measures to avoid, minimize, or mitigate the impacts. Although it is expected that there may be additional changes in conditions by 2020, it would be speculative to attempt to estimate or quantify such changes. Thus, no impacts are quantified under the No Project Alternative.

B. NO PROJECT ALTERNATIVE COMPARED TO MODAL AND HIGH-SPEED TRAIN ALTERNATIVES

The No Project Alternative is the assumed 2020 condition, as described above. Any potential impacts associated with the Modal or HST Alternatives would occur in addition to the impacts associated with the No Project Alternative. For this analysis, the difference in impacts between the Modal and HST Alternatives relative to the No Project Alternative (existing conditions in this case) are compared.

The Modal Alternative, which would result in expansion of existing highway and airport networks, would potentially impact a greater number of Section 4(f) and 6(f) resources (particularly parks and recreation areas) than the HST Alternative, because it would follow and expand existing facilities, typically in areas where urban growth has already expanded to the edges of these facilities. In contrast, the HST Alternative would potentially impact fewer Section 4(f) and 6(f) resources because the proposed HST alignment, stations, and other facilities could be planned and located around, above, or below an identified resource to avoid or minimize potential impacts. As shown in Table 3.16-2, the Modal Alternative would potentially result in a greater number of Section 4(f) and Section 6(f) resources with "high" potential impacts. A complete listing of Section 4(f) and Section 6(f) resources within 900 feet of the Modal and HST alternatives is included as Appendix 3.16-A. Only in the Bakersfield to Los Angeles region would the proposed HST Alternative potentially impact a greater number of Section 4(f) and Section 6(f) resources than the Modal Alternative. Potential Section 4(f) and Section 6(f) impacts for the HST Alternative vary considerably depending upon the HST alignment option. While the Modal Alternative would impact a greater number of potential Section 4(f) and Section 6(f) resources, the HST Alternative has alignment options that bisect Henry Coe State Park and Don Edwards National Wildlife Refuge in the San Francisco Bay Area.

Except in the Bay Area, where the HST alignment on the Caltrain corridor travels within the existing right-of-way and consequently has few direct impacts, the Modal and HST Alternatives are estimated to have approximately the same potential impact on known and potential historical and archeological resources, primarily because these resources are generally located in urban centers where the range of possible alignment and station options is limited. (A detailed analysis of historical and archeological resources is found in Section 3.12, *Cultural and Paleontological Resources*.)

Table 3.16-2^a
California High Speed Rail
Summary of Federal, State/Regional and Other 4(f) and 6(f) Resources

Location	Federal Parks	State/Regional Parks	Other³
Bay Area to Merced Region			
Modal Alternative	0	4	38
HST Alternative	0-1	0-1	3-7
Sacramento to Bakersfield Region			
Modal Alternative	0	5	18
HST Alternative	0-1	1-3	9-15
Bakersfield to Los Angeles Region			
Modal Alternative	1	1	10
HST Alternative	0-1	0-3	4-13
Los Angeles to San Diego via Inland Empire Region			
Modal Alternative	2	2	40
HST Alternative	0-1	2-4	26-39
Los Angeles to San Diego via Orange County Region			
Modal Alternative	3	7	7
HST Alternative	0-3	0	4
Alternative Totals			
Modal Alternative	6	19	113
HST Alternative	0-7	3-11	46-78
Note: The number of potential conflicts associated with the HST Alternative is provided as a range of potential conflicts. For each region, the HST Alternative generally includes various design options within each segment of the region. These routes serve only to provide a reasonable range of impacts for comparative purposes and do not represent any selection of a preferred option. For a complete listing of 4(f) and 6(f) resources within 900' of the Modal and HST alternatives, see Appendix 3.16-A.			

³ "Other" includes local parks, schools, historic sites, and recreational sites.

3.16.4 Comparison of Alternatives by Region

This section outlines the potential impacts of the Modal and HST Alternatives on Section 4(f) and 6(f) resources by region. Differences in potential impacts between HST alignment options are also discussed. Appendix 3.16-A provides summary tables showing a more detailed comparison of the different alternatives and their potential impacts on Section 4(f) and 6(f) resources.

A. BAY AREA TO MERCED

This region contains a variety of Section 4(f) and 6(f) resources, including a federal and a state park—Don Edwards San Francisco Bay National Wildlife Refuge and Henry W. Coe State Park—and approximately 35 local parks that could be affected. In addition, historical resources in the older cities could be affected.

Modal Alternative

The Modal Alternative could impact 42 Section 4(f) and 6(f) resources, primarily local and regional parks adjacent to US-101 and I-880 in the heavily urbanized Bay Area. In addition, the O'Neill Forebay and Wildlife Area near Los Banos could be affected. The Modal Alternative would result in a higher number of potential impacts than the HST Alternative in this region.

High-Speed Train Alternative

The HST Alternative could impact between three and nine Section 4(f) and 6(f) resources, depending on the alignment option. Although approximately 25 local and regional parks are very close to the proposed HST alignment option, the HST would be in the existing railroad corridor as it passes most of these resources between San Francisco and San Jose. However, elsewhere in this region, where the HST alignment options would be adjacent to existing transportation corridors or in a new right-of-way, there would be more potential impacts on parklands (Henry W. Coe State Park) and wildlife reserves (Don Edwards San Francisco Bay National Wildlife Refuge). The HST Alternative would potentially affect more historical resources than the Modal Alternative in this region, primarily in the Bay Area. Overall however, the HST Alternative would result in potential impacts on a fewer number of Section 4(f) and 6(f) resources than the Modal Alternative.

High-Speed Train Alignment Options Comparison

The Caltrain alignment option between San Francisco and San Jose would potentially impact fewer Section 4(f) and 6(f) resources than the East Bay alignment options. The primary reason for this difference is that the HST would travel within the Caltrain right-of-way, and therefore not directly affect any Section 4(f) or 6(f) resources in and along the Caltrain corridor.

Between Oakland and San Jose, the Hayward/Niles/Mulford alignment option has the potential to impact the Don Edwards San Francisco Bay National Wildlife Refuge because the existing railroad right-of-way is not consistently wide enough for the HST. Given the high sensitivity of this area and the concerted effort of the state and federal governments, many nonprofit organizations, and individuals to restore this area, it potentially may be difficult to identify meaningful mitigation measures for this alignment option (see Figure 3.16-1). The Hayward/I-880 alignment option, which serves the same corridor, would potentially affect some local and regional resources (such as Marshall Park in Fremont), but it would not directly impact the highly sensitive Don Edwards San Francisco Bay National Wildlife Refuge.

From San Jose to Merced, the minimize tunnel option of the Diablo Range direct northern alignment could impact Henry W. Coe State Park. As with the Mulford alignment option, it may be difficult to identify meaningful mitigation measures for the impacts of the minimize tunnel option on the state park. Henry W. Coe State Park contains one of the last large public

wilderness areas in this part of northern California. Thus, even with the significant tunneling included in the minimize tunnel option, the option could impact wildlife and wildlife habitat. There are several potential avoidance options under consideration. These include a tunnel under the park that would avoid use of the park, an alignment option north of the park that avoids the park, and the Pacheco Pass alignment options. While the southern crossing options (Pacheco Pass) to Gilroy would not affect as many Section 4(f) or 6(f) resources as the northern alignment options, one of them would travel through Gilroy where it could affect the historic Gilroy train station and other historic structures. The eastern end of the northern alignment may result in potential impacts on McConnell State Recreation Area.

B. SACRAMENTO TO BAKERSFIELD

The HST Alternative has the potential to affect fewer individual recreational resources than the Modal Alternative in this region. Because the Modal Alternative footprint traverses large federal and state resources in the Sacramento to Stockton and Merced to Fresno corridors, it would be likely to affect more Section 4(f) and 6(f) acreage than the HST Alternative. In downtown Sacramento, where there is a high concentration of historical resources, both the Modal and HST Alternatives would have potential impacts on historical and archeological resources.

Modal Alternative

The Modal Alternative could affect 23 resources, including the Stone Lakes National Wildlife Refuge along I-5 in Sacramento County and several state and federal parklands along SR-152 west of Fresno in Merced and Madera Counties. In addition, the Modal Alternative could affect smaller local (city and county) parks. The Modal Alternative could affect more Section 4(f) and 6(f) resources than the HST Alternative in this region.

High-Speed Train Alternative

The vast majority of the between 10 and 19 Section 4(f) and 6(f) resources potentially affected by the HST Alternative are local (city and county) parks, although Burlington Northern Santa Fe (BNSF) alignment options in the Tulare to Bakersfield corridor could also affect the Pixley National Wildlife Refuge and the Colonel Allensworth State Historical Park. The HST Alternative would affect a fewer number of Section 4(f) and 6(f) resources than the Modal Alternative.

High-Speed Train Alignment Options Comparison

In the Sacramento to Stockton corridor, there is little distinction between HST alignment options with respect to Section 4(f) and 6(f) potential impacts. Alignment options to the downtown Sacramento Valley Station would potentially impact the American River Parkway. There are generally more local (city and county) parks along the Union Pacific Railroad (UPRR) alignment than the Central California Traction (CCT) alignment option in this corridor.

From Modesto to Merced, the UPRR alignment has the potential to affect more Section 4(f) and 6(f) resources than the BNSF alignment because the Stanislaus County Fairgrounds, Broadway Park, and Central Park in Turlock are adjacent to the UPRR right-of-way.

Between Madera and Fresno, there may be potential impacts on public parkway lands managed by the state San Joaquin River Conservancy along the San Joaquin River.

Section 4(f) and 6(f) resources are present from Tulare to Bakersfield, but both the UPRR and BNSF alignments have the potential to affect the same number of resources. The proposed Golden State Station would potentially affect the Metro Recreation Center, which sits adjacent to the UPRR alignment.

C. BAKERSFIELD TO LOS ANGELES

The Section 4(f) and 6(f) resources that dominate this region are the Angeles National Forest and state and county parks that cross the Tehachapi Mountains. In addition, there are many smaller county and city parks, as well as historic properties in the urban areas of Los Angeles County.

Modal Alternative

The Modal Alternative would potentially affect 12 Section 4(f) and 6(f) resources in this region. The highway portion of the Modal Alternative would potentially affect Fort Tejon State Historical Park, Griffith Park, and Vasquez Rocks County Park. The airport portion (Burbank Airport) of the Modal Alternative would potentially affect Sun Valley Park and Recreation Center in the City of Los Angeles. The Modal Alternative would potentially affect the same number of Section 4(f) and 6(f) historical and archeological resources as the HST Alternative.

High-Speed Train Alternative

Since the HST Alternative would use essentially the same transportation corridors from Bakersfield to Los Angeles as the Modal alternative, the HST and Modal Alternatives would result in a similar number of potential impacts in the region.

High-Speed Train Alignment Options Comparison

The alignment options for the HST Alternative from Bakersfield to Los Angeles would result in a considerable range of potential impacts. Between Bakersfield and the Sylmar Station, the I-5 alignment option would result in the most potential impacts (eight) of the three alignment options. Some of the resources that could be impacted include Fort Tejon State Historical Park, Angeles National Forest, Pyramid Lake, and Hungry Valley State Vehicular Recreation Area (see Figure 3.16-2).

The SR-58/Soledad Canyon alignment option would result in the fewest potential impacts (zero). From Sylmar to downtown Los Angeles, the MTA/Metrolink alignment option has fewer potential impacts than the I-5 option because there are fewer local and regional parks. The I-5 option has potential impacts on Griffith Park and Elysian Park and bisects the Cornfields property. The potential for impacts on historical resources increases the closer the alignment options get to Los Angeles; however, impacts on historical resources is not a differentiating factor for the alignment options in this region.

D. LOS ANGELES TO SAN DIEGO VIA INLAND EMPIRE

Section 4(f) and 6(f) resources identified in this region that could be affected were generally regional and local parks and recreation areas.

Modal Alternative

The Modal Alternative could affect approximately 44 Section 4(f) and 6(f) resources in this region. The majority of these resources would be local and regional parks, with the exception of Riverside National Cemetery and Cleveland National Forest. The Modal Alternative would result in slightly more potential impacts than the HST Alternative.

High-Speed Train Alternative

Similar to the Modal Alternative, the HST Alternative could impact county and local parks. The HST Alternative could potentially impact as few as 28 resources, compared to 44 for the Modal Alternative.

High-Speed Train Alignment Options Comparison

Section 4(f) and 6(f) resources are fairly evenly distributed in the region. Therefore, the impacts of the alignment options on Section 4(f) and 6(f) resources in this region would be similar. One exception is between Mira Mesa and San Diego, where the alignment option that would follow I-15 to Qualcomm Stadium would potentially impact nine Section 4(f) resources, while the other alignment options, LOSSAN and LOSSAN via Carroll Canyon to downtown San Diego, would potentially impact five resources, respectively.

E. LOS ANGELES TO SAN DIEGO VIA ORANGE COUNTY

The Section 4(f) and 6(f) resources identified in this region are primarily local and regional parks, and several state beaches. The Modal Alternative would include the acquisition of new right-of-way between Los Angeles and San Diego, which would potentially affect 20 Section 4(f) and 6(f) resources along the alignment. Overall, there is no significant difference in the number of resources that would be potentially affected by the Modal and HST Alternatives. The proposed HST alignment is within the existing right-of-way. Much as in the Bay Area, the majority of these alternative alignments would occur along existing transportation/rail corridors, and the potential for impacts would be temporary or could be reduced by mitigation strategies.

Modal Alternative

The Modal Alternative (17 potential impacts) would impact on Section 4(f) and 6(f) resources than the overall HST Alternative (4 to 7 potential impacts). Those resources that are potentially affected are primarily local parks.

High-Speed Train Alternative

Although construction of the HST Alternative is expected to occur within 150 ft (46 m) of some parks and refuge lands, the majority of the activities would be within the existing UPRR and LOSSAN rail corridors. The railroad was originally constructed in the 1800s, before most parks and conservation lands were established around it.

High-Speed Train Alignment Options Comparison

The two alignment options and proposed station locations between LAUS and Irvine are not differentiated by potential impacts on Section 4(f) and 6(f) resources because there are few such resources in this industrial area. The UPRR alignment would potentially impact three Section 4(f) and 6(f) resources, and the LOSSAN corridor would potentially impact five of these resources.

3.16.5 Impact Avoidance Strategies, Including Alternatives Screened from Further Consideration

Throughout the environmental review process, and particularly in the identification of potential HST alignment and station options, the California High Speed Rail Authority (Authority) has emphasized minimizing harm to the environment. One of the Authority's policies, as stated in Chapter 1, is "to maximize the use of existing transportation corridors and right-of-way to the extent feasible." This policy is one of the primary impact avoidance strategies for the proposed HST system. This policy and the other goals implicit in the HST project purpose and need were used in the scoping process and successive screening stages of the program environmental process (see Chapter 2, *Alternatives*). The screening evaluation considered the potential impacts of the various alignments and all the environmental parameters, including impacts on Section 4(f) and 6(f) resources. Based on the overall screening evaluation, several segments in the Bakersfield to Los Angeles region were removed from further consideration, in part due to potential impacts on Section 4(f) and 6(f) resources (see Figure 3.16-2). The screening alignment studies resulted in realignment of the Tehachapi segment of the HST Alternative to avoid impacts on resources, including parks, in the town of Tehachapi. In the Bay Area, different alignment options were developed to avoid Henry W. Coe State Park (see Figure 3.16-1). At the end of

this process, at least two viable alignment options were identified for each segment of the entire HST system, except for a few cases where clear and documented data were available to limit the options to a single alignment. The screening recommendations were developed by the Authority and the Federal Rail Authority, with input from federal cooperating agencies; state, regional, and local agencies; and members of the public.

3.16.6 Avoidance Alternatives or Reasons for No Prudent or Feasible Alternative for Use of Section 4(f) or 6(f) Resource

If the proposed HST system is approved to go forward, the design studies and project-level environmental review for a proposed HST system would compare specific alignment alternatives selected for further study and seek additional opportunities to avoid or substantially reduce potential adverse impacts of these alternatives on identified Section 4(f) and 6(f) resources.

Potential direct impacts on many Section 4(f) and 6(f) resources could be avoided by remaining within existing railroad right-of-way, or moving horizontally within the right-of-way, where feasible. Avoidance of Section 4(f) and 6(f) resources would be further explored during project-specific design and environmental evaluation. Project-level evaluations of Section 4(f) and 6(f) resource use would include documentation of the avoidance alternatives and/or reasons for no prudent or feasible alternative for impacts on Section 4(f) and 6(f) resources for the segments being studied.

There are several potential Section 4(f) and 6(f) recreation resources and cultural resources within or immediately adjacent to the proposed alignments for the Modal and HST Alternatives. Avoidance of these resources would be possible in many cases by redesigning or narrowing the disturbance limits, in combination with noise walls and/or visual screening. However, there may be locations where avoidance could not be achieved, possibly for one of more of the following reasons.

- Shifting the centerline (and the whole facility) to avoid one or more resources could result in greater potential impacts on other resources. For example, segments of some highways include a number of very large Section 4(f) and 6(f) resources on both sides. It may not be possible to fully avoid use of all of these resources under the Modal Alternative, assuming that reconstruction of the facility in a tunnel section is not feasible.
- The HST alignment options cannot be shifted easily because of the large turning radii required for HST operations and other design considerations. A minor shift in one location on the HST alignment could result in a substantial shift elsewhere on the alignment, potentially resulting in impacts on other Section 4(f) and 6(f) resources.
- Measures to reduce potential proximity impacts, such as noise walls, could result in potential adverse visual impacts on Section 4(f) and 6(f) resources. During project-level review, potential measures to minimize harm at each potentially affected resource would need to be analyzed in consultation with the owners of the resources to ensure that measures to minimize harm would not adversely affect the values of the Section 4(f) and 6(f) resources.

3.16.7 Design Practices

The Authority is committed to utilizing existing transportation corridors and rail lines for the proposed HST system in order to minimize potential impacts adjacent properties, particularly parks and recreational lands. Nearly 70% percent of the preferred HST alignments are either within or adjacent to a major existing transportation corridor (existing railroad or highway right-of-way), thus minimizing potential for impacts to these important resources.

The FRA is committed to complying with Sections 4(f) and 6(f) of the DOT Act of 1966 as amended through subsequent project-level design and evaluation. Many potential 4(f) and 6(f) uses have been avoided through evaluation incorporated in this program EIR/EIS and additional steps will be taken at the

project level to ensure that there is no prudent or feasible alternative to the use of 4(f) and 6(f) resources.

The Authority is committed to avoiding impacts to parklands to the extent feasible and practical through careful alignment design and selection. The avoidance of State Park units is a good example of this practice. The Authority has identified a preferred HST alignments extending over 700-miles long. Of the 278 State Parks, only five State Parks would be within 900 feet of the 700+ miles of preferred HST alignment, and no State Parks would be crossed or bisected by the HST Alternative. It is an objective of the Authority to further avoid and minimize potential impacts to the five State Parks through alignment refinement during subsequent project level environment review.

3.16.8 Mitigation Strategies and CEQA Significance Conclusions

Possible mitigation measures for potential impacts on Section 4(f) and 6(f) resources include sound walls, visual buffers/landscaping, and modification of transportation access to/egress from the resource. Some of these measures could include design modifications or controls on construction schedules, phasing, and activities. Planning efforts would be undertaken as a part of the project-level documentation phase to minimize harm to the Section 4(f) and 6(f) resources. This is anticipated to include measures that may be taken to mitigate potential adverse environmental impacts, such as beautification measures, replacement of land or structures or their equivalents on or near their existing site(s), tunneling, cut and cover, cut and fill, treatment of embankments, planting, screening, creating wildlife corridors, acquisition of land for preservation, installation of noise barriers, and establishment of pedestrian or bicycle paths. Other potential mitigation strategies could be identified during the public input process.

Based on the analysis above, and considering the CEQA Appendix G thresholds of significance for recreation resources, the proposed HST system alternative would have a potentially significant effect on public parks and recreation resources when viewed on a systemwide basis. Although public parks and other recreational have largely been avoided by the placement of conceptual corridors for the HST system, and additional avoidance and mitigation strategies will be applied in the second-tier, project-level analyses, some parks and recreational resources may ultimately be affected should a decision be made to proceed with the development of the HST system. At the programmatic level of analysis, it is not possible to know precisely the location, extent and particular characteristics of impacts to park resources. Because of this uncertainty, at the programmatic level of analysis the impact is considered significant. Mitigation strategies, as well as the design practices discussed in section 3.16.7, will be applied to reduce these impacts.

In the event that HST alignments or facilities are located within or in close proximity to public parks, the following mitigations for natural, cultural, aesthetic and recreational impacts would be considered, including but not limited to:

1. Compensation for temporary and loss of park and recreation use.
2. Recordation of any historic features removed.
3. If necessary, provide alternative shuttle access service to park visitors.
4. Restore directly impacted park lands to a natural state.
5. If any facilities must be relocated, provide planning studies as well as design and appropriate replacement with minimal impact on park use.
6. Inventory and record affected historic structures. Provide appropriate mitigation for adverse effects to historic structures.
7. Require appropriate vehicle cleaning for all construction equipment used near units of the California State Park System to protect against spreading exotic plants or disease.

8. Use local native plants for revegetation.
9. Design and construct cuts, fills, and aerial structures to avoid and minimize visual impact to units of the State Park System.
10. In addressing impacts to wildlife movement corridors and habitat directly related to California State Park System units, consult with the California Department of Parks and recreation.
11. Incorporate wildlife under- or over-crossings as necessary.
12. Adopt construction practices to protect critical wildlife corridors and visitor use areas within public parks.

The above mitigation strategies are expected to substantially lessen or avoid impacts to public park resources in most circumstances. At the second-tier, project-level review it is expected that for proposed HST alignments which would result in impacts to park resources, most of the impacts to individual park resources will be avoided or mitigated to a less-than-significant level, but it is possible that for some parks impacts will be significant. Sufficient information is not available at the program level to conclude with certainty that the above mitigation strategies will reduce impacts to all affected public park resources to a less than significant effect in all circumstances. Therefore, potential impacts to parks are considered significant at the program level even with the application of mitigation strategies. Additional environmental assessment will allow more precise evaluation in the second-tier, project-level environmental analyses, as well as any needed 4(f) and 6(f) findings.

3.16.9 Subsequent Analysis

The Section 4(f) and 6(f) evaluation process would be more focused at the project-specific level. Given the broad focus of analysis for this Program EIR/EIS, the primary goal for project-level analysis would be to identify Section 4(f) and 6(f) resources and potential impacts in greater detail, to identify the existence of potential prudent and feasible alternatives, and to identify and analyze potential mitigation measures.

The following items would be included in the Section 4(f) and 6(f) evaluations at the project level.

- Detailed physical descriptions of a specific portion of the proposed HST system (including plans and profiles).
- Updated list of all Section 4(f) and 6(f) recreation resources in proximity to the proposed alignment centerlines and project components, using the most recent mapping available such as annually updated Thomas Bros. maps, general plans, state Web sites, local jurisdiction Web sites, etc.
- Updated list of NRHP-listed and NRHP-eligible cultural resources. As part of detailed cultural resources studies required for project-level environmental review (see Section 3.12.7), all previously identified potentially eligible resources would be further evaluated to determine NRHP eligibility. NRHP-eligible resources would be carried forward to the project-level Section 4(f) and 6(f) evaluation. Field reconnaissance would be needed to complete the required Section 4(f) inventory sheets.
- List of the CRHR-listed and eligible resources and field reconnaissance to provide a complete inventory and description of these resources.
- Descriptions of uses and functions of each Section 4(f) and 6(f) resource, including location map; size; services and facilities; annual patronage; unique qualities; relationship to other lands in the project vicinity; owner/operator; other relevant information regarding the resource; and explanation of the significance of the properties as determined by federal, state, regional, or local officials with jurisdiction over the resource.
- Detailed descriptions of the proposed uses of and potential impacts on Section 4(f) and 6(f) resources and of the methods used to identify them. Specific potential impacts on each resource

would be identified, including proximity impacts as a result of impacts on ambient noise, air quality, transportation, and visual resources.

- Identification and refinement of strategies to avoid or minimize use of and impacts on Section 4(f) and 6(f) resources by narrowing rights-of-way/disturbance limits, realigning/relocating project features, and developing other alignment adjustments. These strategies would analyze, as appropriate, the technical feasibility of possible mitigation, including cost estimates with figures showing percentage differences in total project costs, possibility of community or ecosystem disruption, and other potential significant adverse environmental impacts of each alternative; and show the financial, social, or ecological costs or potential adverse environmental impacts of each alternative, as well as any unique problems and extraordinary magnitudes of impacts.
- Documentation of consultation with the affected local jurisdictions and owners/operators of the identified Section 4(f) and 6(f) resources. This would include documentation of concurrence or efforts to obtain concurrence from the public official or officials having jurisdiction over the Section 4(f) and 6(f) resources and documentation of the planning to minimize harm to the affected resources. (Refer to Chapter 9, Persons and Organizations Contacted, for additional discussion of these consultations.) In addition to the mitigation proposed, the Section 4(f) and 6(f) evaluation should document the National Park Service's tentative position relative to any proposed Section 6(f) conversion and should address the need for replacement lands under federal and California law (Federal Highway Administration 1987).

3.17 CUMULATIVE IMPACTS EVALUATION

This section describes the potential for the No Project, Modal, and High-Speed Train (HST) Alternatives to contribute to cumulative impacts related to various environmental resources. Other sections of this chapter describe and consider the potential effects from completion of the multitude of highway and aviation elements of the Modal Alternative, and alternatively, completion of all stations and route segments of the HST Alternative. Chapter 5 describes the potential for indirect growth inducing effects of the system alternatives. Section 6B addresses policies and practices that would guide project level consideration of the HST Alternative to avoid and minimize indirect growth effects of HST stations.

As provided for in CEQA and NEPA for program documents, this Program EIR/EIS generally analyzes broad environmental effects of the program for the high-speed train system and alternatives. Site-specific environmental review will be required for implementation of the various elements of the program. The level of analysis is consistent with the level of detail of the program; for subsequent approvals, where more detail is learned about the program, more detail regarding the impacts and mitigation measures will be disclosed in subsequent CEQA and NEPA reviews. The cumulative impact analysis for this Program EIR/EIS, therefore, follows this basic tenet – cumulative impacts are analyzed at a broad scale because of the general nature of the program description. Consideration of project-specific and local area cumulative effects, including specific urban development, will be undertaken as part of future project level environmental review. Consideration of the indirect effects related to the reasonably foreseeable population and employment growth that could result from the proposed action and alternatives is addressed in Chapter 5, *Economic Growth and Related Impacts*.

3.17.1 Regulatory Requirements and Methods of Evaluation

NEPA and CEQA require lead agencies to evaluate a proposed undertaking's potential to contribute to cumulative impacts in the project or program area. *Cumulative impact* refers to the combined effect of "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts" (CEQA Guidelines Sec. 15355). As defined by the State of California, cumulative impacts reflect

... the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time (CEQA Guidelines Sec. 15355[b]).

This is consistent with NEPA's use of the term (see CEQ NEPA regulations, 40 CFR 1508.7). The President's Council on Environmental Quality (CEQ) guidance on cumulative impacts further recognizes two categories of cumulative impacts: those that represent the additive effect of repeated activities taking place as part of a single proposed undertaking, and those that represent the combined effect of activities taking place under more than one proposed undertaking (Council on Environmental Quality Guidance Regarding Cumulative Effects, January 1997).

CEQA requires the lead agency to identify projects and programs related to the undertaking being analyzed and evaluate the combined (cumulative) effects of those related projects on the environment. If any cumulative impacts are identified as significant, the lead agency must then assess the degree to which the proposed undertaking would contribute to those impacts, and identify ways of avoiding or reducing any contribution evaluated as "cumulatively considerable" (CEQA Guidelines Sec. 15130[b]). CEQ's cumulative impact guidance similarly directs lead agencies to restrict analysis of cumulative impacts to those that are meaningful (Council on Environmental Quality 1997). Although both CEQA and NEPA include the requirement to consider "past projects" when addressing cumulative impacts, recent CEQ

guidance discounts the value of this assessment of past projects directing that relevance of addressing past projects relates to the “concise description of the identifiable present effects” (CEQ June 24, 2005 Memorandum).

Under CEQA, lead agencies may use a “list” approach to identify related projects for analysis, or may base the identification of cumulative impacts on a summary of “projections” in an adopted general plan or related planning document. CEQ’s guidance is consistent with CEQA’s approach and offers additional strategies to identify cumulative impacts requiring analysis, such as: input from questionnaires, interviews, and panels; use of analytical tools such as checklists, matrices, and system diagrams; modeling and trends analysis; and for resources where spatial relationships are important, GIS analysis. In this Program EIS/EIR, both the list and projections approaches have been adapted and used.

This cumulative impact analysis focuses on the resources potentially affected by the proposed action and alternatives and identifies where there may be impacts to these resources, when considering past, present, and reasonably foreseeable future actions. The impact analysis focuses on other broad regional/statewide past, present and probable future projects, including other highway improvements and transit projects within the study area and within the same areas of potential effect evaluated for the conceptual corridors included as part of the No Project, Modal, and HST Alternative alignments. Because of the population growth potential and the proximity to study corridors and stations analyzed in this environmental document, a few other major projects are also considered as part of the cumulative analysis, including the University of California (UC) at Merced campus. Appendix 3.17-A lists the projects identified for consideration in this cumulative impact analysis. While other project-specific actions may be likely to occur in the study area by 2020, this Program EIR/EIS analyzes the broad environmental issues based on the broad program definition and the regional statewide cumulative impacts and, therefore, does not consider the more localized cumulative issues related to subsequent approvals.

Information from existing environmental documents completed for regional projects, such as regional transportation plans that include the highway and airport improvement projects approved for future implementation under the No Project Alternative and projections made in the state implementation plan for air quality, were used. The list of these projects is included in Chapter 2, *Alternatives*, Tables 2.5-1 and 2.5-2, and in the air quality section (Section 3.3) of Chapter 3. The cumulative impact analysis for each resource identifies whether there is a significant cumulative impact under the No Project Alternative, if the proposed action and alternatives have a considerable contribution to the cumulative impact, and the availability of mitigation measures at the program level to avoid, minimize, or compensate for the cumulative impact. However, specific analysis of localized impacts and related cumulative impacts, as well as mitigation related to these cumulative impacts that could occur for subsequent project-specific approvals, will need to be addressed through project-level CEQA and NEPA compliance.

3.17.2 Cumulative Impacts Analysis

The following analysis describes the potential for the Modal and HST Alternatives to contribute to cumulative impacts related to each environmental topic of Chapter 3. The environmental topics are discussed herein in the same order as they appear in Chapter 3. The No Project Alternative is mentioned only when there are potential cumulative impacts that could result from not proceeding with the Modal or HST Alternatives (examples: air quality, energy, traffic congestion). Where the No Project Alternative would not result in impacts by 2020, or where the existing conditions would not change (or future conditions were considered too speculative to predict), the No Project Alternative is not addressed.

A. TRAFFIC AND CIRCULATION AND TRAVEL CONDITIONS

As described in Chapter 3 (Sections 3.1 and 3.2), the program level impact analysis of traffic and circulation and travel conditions focused on traffic and LOS analysis of intercity highway segments, primary highway/roadways accessing proposed HST stations, and primary highway/roadways

accessing airports; and potential impacts on transit, goods movement, and parking for each of the regional corridors and proposed stations and airports. Impacts to travel conditions included analysis of travel time, reliability, safety, connectivity, sustainable capacity, and passenger cost. Intercity travel in California is expected to grow from 155 million trips to more than 209 million trips in the next 20 years, with an estimated 58% of these trips made by automobile, as stated in the purpose and need chapter of this Program EIR/EIS (Chapter 1). More than half of the 65 highway segments analyzed in this study would operate at unacceptable conditions (level of service F) under the No Project Alternative. The expected increase in the number of autos on the highways by 2020 would also result in significant travel delays and congestion under the No Project Alternative, which would have significant potential impacts on the state's economy and quality of life. Under the No Project Alternative there would be adverse effects related to traffic and LOS on intercity highway segments, primary highway/roadways accessing proposed HST stations, and primary highway/roadways accessing airports. There would be adverse impacts on transit, goods movement, and parking for each of the regional corridors and proposed stations and airports. Therefore, the cumulative impact, when considering past, present, and reasonably foreseeable future projects related to traffic and circulation would, without implementation of either the Modal or HST alternative, be significant (See Chapter 3, Section 3.1).

The Modal Alternative and the HST Alternative would improve the existing highways and airports beyond what is approved and funded under the No Project Alternative; however, congestion and travel delays would worsen on surface streets leading to and from the intercity highways and airports, contributing to cumulative traffic impacts. Therefore, implementation of the Modal Alternative or HST Alternative would not lead to a considerable contribution to the cumulative impact related to highway and airport use but could be a considerable contribution to the cumulative impact related to surface streets leading to and from the intercity highways and airports. Program mitigation strategies, as discussed in Chapter 3 (Section 3.1.6) could be developed, in consultation with state, federal, regional, and local governments and affected transit agencies, to improve the flow of intercity travel on the primary routes and access to the proposed stations or airports. Regional strategies would include coordination with Regional Transportation planning and Intelligent Transportation System Strategies. Local improvements could employ TSM/Signal Optimization; local spot widening of curves; and major intersection improvements.

Implementation of the proposed HST Alternative would result in about 38.5 million fewer long-distance passenger trips by automobile annually than would be expected with the Modal Alternative improvements, as discussed in Section 3.2, *Travel Conditions*. This outcome would benefit intercity highways and would potentially reduce travel delays on the affected highways and on surface streets leading to and from intercity highways. Localized traffic conditions around some HST stations would experience a decrease in level of service and some added delays, and transit lines serving the stations areas would experience increases in passengers during peak hours. Therefore, implementation of the Modal Alternative or HST Alternative could lead to a considerable contribution to the cumulative impact related to localized travel conditions. Program mitigation strategies, as discussed in Chapter 3 (Section 3.1.6) could be developed, in consultation with state, federal, regional, and local governments and affected transit agencies, to improve the flow of intercity travel on the primary routes and access to the proposed stations or airports. Regional strategies would include coordination with Regional Transportation planning and Intelligent Transportation System Strategies. Local improvements could employ TSM/Signal Optimization; local spot widening of curves; and major intersection improvements. Site-specific traffic analysis would be part of subsequent project evaluation of local impacts around station locations if a decision were made to pursue the HST Alternative.

B. AIR QUALITY

As described in Chapter 3 (Section 3.3), the program level impact analysis of air quality focused on the potential statewide, regional, and localized impacts related to pollutant burdens occurring from highway vehicle miles traveled, number of plane operations, number of train movements, and power requirements. The analysis of air quality considers emissions of projected regional growth by the California Air Resources Board (CARB) for eight criteria pollutants (CO, SO_x, HC, NO_x, O₃, PM₁₀, PM_{2.5}, and Pb) in the six air basins potentially affected, and therefore includes past, present, and reasonably foreseeable projects/actions and population growth as part of the No Project Alternative. The analysis is structured to estimate the potential impacts on the air quality on the local and regional levels in six air basins directly affected by the project alternatives. These basins are Sacramento Valley, San Francisco Bay Area, San Joaquin Valley, Mojave Desert, South Coast, and San Diego County. Under the No Project Alternative there would be adverse cumulative effects related to air quality that are considered significant (See Chapter 3, Section 3.3).

The Modal Alternative would add about 2,970 lane mi (4,780 lane km) to existing highways. The result of the additional lane miles would be an estimated increase of 1.1% of highway vehicle miles traveled (VMT), which is predicted to increase the amount of regional pollutants generated by 1.1% over the No Project Alternative. This outcome would equate to 3,190 tons (2,894 metric tons) of CO per day; 629 tons (571 metric tons) per day of NO_x, and 1.4 million tons (1.3 million metric tons) per day of CO₂. The Modal Alternative would have a high potential impact on air quality. The ranking of high, medium, or low as discussed in Section 3.3 is based on the magnitude of the emission changes compared to the No Project Alternative emission budget and general conformity threshold levels for non-attainment and maintenance areas. Exceeding 10% of a non-attainment or maintenance inventory for a pollutant would be regionally significant. Potential localized air quality impacts associated with construction-generated dust (particulates or PM₁₀) are also expected. When combined with the potential impacts of other highway or airport or major development projects like the UC campus in Merced in other corridors and areas within the six air basins, implementation of the Modal Alternative could lead to a considerable contribution to the cumulative impact related to air quality impacts.

It is estimated that the proposed HST Alternative would be able to accommodate 68 million people annually for intercity trips, according to the Business Plan sensitivity analysis and discussed in depth in the air quality section. Intercity passengers using this alternative would otherwise use the roadways and airports, and the result is a potential 1.8% reduction in VMT on the state highway system, and a reduction in emissions from the reduced number of flights (42.7 million auto trips and 25.3 million air trips would shift to HST annually, according to the sensitivity analysis). Overall, pollutants would decrease in all air basins analyzed compared to the No Project Alternative baseline: CO 24.2%, PM₁₀ 0.62%, NO_x 4.1%, and total organic gases 3.1%. Therefore, the HST Alternative would result in an air quality benefit. The benefit could increase if the HST ridership increased beyond the levels assumed in this document. However, as described in Chapter 3 (Section 3.3.), there may be localized air quality impacts from the HST alternative.

Overall, the potential impacts of either the Modal or HST Alternatives, in combination with the air quality impacts of other highway projects or airport improvements identified for this cumulative impact analysis (Appendix 3.17-A) and those projects considered in the state implementation plan for air quality could be a considerable contribution to cumulative air quality impacts within the six-basin study area. Local adverse air quality impacts could occur near HST stations related to traffic. Program-level analysis reviews the potential statewide air quality impacts that would support determination of conformity, as discussed in Chapter 3 (Section 3.3.5). At the project level, mitigation strategies to address localized impacts could consider increasing emission controls from power plants supplying power for the Modal Alternative or HST Alternative; designing the system to utilize energy efficient, state-of-the-art equipment; promoting increased use of public transit,

alternative fueled vehicles, and parking for carpools, bicycles, and other alternative transportation methods; alleviation of traffic congestion around passenger station areas; and minimizing construction air emissions.

C. NOISE AND VIBRATION

Noise and vibration impacts, particularly in growing urban areas and along highway corridors, will continue to increase as population grows and use of highways and airports increases. Therefore, the cumulative impact, when considering past, present, and reasonably foreseeable future projects related to noise and vibration would be significant (See Chapter 3, Section 3.34).

Implementation of the Modal Alternative could potentially result in high noise impacts along approximately 210 mi (338 km) of highway alignment and expansion of existing airport perimeters. When combined with the noise impacts associated with other projects, the Modal Alternative could contribute to localized cumulative noise and vibration impacts, primarily in urban areas with a higher density of receptors.

Implementation of the proposed HST Alternative could potentially result in high noise impacts along approximately 8 mi to 133 mi (13 km to 214 km) of alignment, depending on the alignment options selected. These potential impacts, when combined with the potential noise impacts of other highway, roadway, and transit expansion projects in the region, could contribute to localized potential cumulative noise impacts during construction and operation.

Overall, the potential impacts of either the Modal or HST Alternatives could be a considerable contribution to cumulative noise and vibration impacts. Program-level mitigation for noise and vibration impacts, as discussed in Chapter 3 (Section 3.4.5), relates to design practices emphasizing the use of tunnels or trenches; use of electric powered trains, higher quality track interface, and smaller lighter and more aerodynamic trainsets; and full grade separations from all roadways. At the project level, mitigation strategies to address localized noise and vibration impacts should include treatments for insulation of buildings affected by noise and vibration; sound barrier walls within the right-of-way; track treatments to minimize train vibrations; and construction mitigation (See Chapter 3, Section 3.4.6).

D. ENERGY

Continued dependence on automobiles and air travel for intercity trips would result in annual consumption of an estimated 24.3 million barrels of oil per year for the No Project Alternative, considering the past, present, and reasonably foreseeable future projects. The potential cumulative impact on energy consumption would be significant.

The Modal Alternative would result in consumption of an additional 0.2 million barrels per year (24.5 million barrels total). The Modal Alternative could cause a considerable contribution to cumulative energy impacts when considered with other highway and airport projects in the state, and with large development projects that would consume energy (like the new UC Merced campus). Program-level mitigation for energy impacts, as discussed in Chapter 3 (Section 3.5.6), relates to design features that could be included at project-level analysis, including minimizing grade changes, using energy saving equipment, maximizing intermodal transit connections, and development and implementation of an energy conservation plan.

The HST Alternative would reduce energy consumption by an estimated 4.8 to 5.3 million barrels of oil annually (an 8-22% savings compared to the No Project Alternative). This outcome compares with an annual increase under the Modal Alternative of 0.2 million barrels over the No Project Alternative energy use in 2020. This conservative estimate is based on use of average size trains

that could be expanded to carry more passengers; the potential energy benefits could be substantially higher if train capacity and ridership were increased. The proposed HST Alternative would have a beneficial effect on energy consumption in the state and, therefore, would not be a considerable contribution to the cumulative energy impacts.

E. ELECTROMAGNETIC FIELDS AND ELECTROMAGNETIC INTERFERENCE

As described in Chapter 3 (section 3.6.2), Electromagnetic fields (EMFs) exist in the environment both naturally and as a result of human activities. By the year 2020, EMFs along existing roadways and railroad rights-of-way would probably be affected by technological developments and by increases in total energy consumption. For example, general EMF levels along highways may be cumulatively increased by advanced automotive technologies such as collision avoidance systems and automatic vehicle guidance systems, if such technologies are implemented by 2020, and increased reliance on electrically powered automobiles. Improvements to airports may also increase environmental EMFs because of increased use of radar, radio communications, and instrument landing systems. Based on available information, these changes are not likely to cause significant changes in EMF levels, increased human exposures to EMFs, or electro-magnetic interference (EMI) in the environment; therefore, significant cumulative impacts from EMFs or EMIs associated with past, present, and reasonably foreseeable future projects within the study area are not anticipated.

The Modal and HST Alternatives would traverse a range of geographic and land use typologies and could result in potential EMF exposure in urban, suburban, rural, agricultural, and industrial areas. The various components of the HST infrastructure and the trains themselves would be sources of EMFs at both extremely low frequency (ELF) and radiofrequency (RF). It is likely that some additional potential for human exposure to EMFs and EMI would occur with the HST Alternative in combination with other proposed projects (potential activities include transmission lines and other electric rail systems); however, although the Modal and HST Alternatives could cause direct and indirect EMF and EMI impacts, there would not be a considerable contribution to in EMF and EMI levels because mitigation included in project-level analysis would include design choices (tunnel, elevated track, physical barriers between track and receptor, or facility site selection) and through shielding to avoid or minimize potential EMF and EMI impacts.

F. LAND USE AND PLANNING, COMMUNITIES AND NEIGHBORHOODS, PROPERTY, AND ENVIRONMENTAL JUSTICE

As described in Chapter 3 (Section 3.7.3), the land use and local communities are expected to change between 2003 and 2020 as a result of past, present, and reasonably foreseeable future projects, related to population growth and changes in economic activity in the five regions (see also, Chapter 5, Economic Growth and Related Impacts). It is expected that some changes related to land use compatibility, communities and neighborhoods, property, and environmental justice will occur, even though it is assumed that reasonably foreseeable future projects would include typical design and construction practices to avoid or minimize potential impacts. Therefore, significant land-use compatibility, communities and neighborhoods, property, and environmental justice cumulative impacts associated with past, present, and reasonably foreseeable future projects within the study area are anticipated.

Under the Modal Alternative, the expansion of the existing highway system would continue the historic trend of impacts from land use/urban sprawl related to population growth and impacts on land made accessible by automobile. The highway improvement options would not support local and regional planning objectives that promote transit-oriented higher-density development around transit nodes as the key to planned in-fill development for more efficient use of land and resources. Combined with other highway corridor projects in the five regions, the Modal Alternative would contribute to the promotion of sprawl along improved highways. Additionally, 309 mi (497 km) of

highway alignment (20% of total highway alignment length) would affect potentially sensitive residential land uses subject to significant impacts, and 289 mi (465 km) of alignment (19% of total improved highway alignment distance) would affect medium-sensitivity land uses. When combined with the property impacts of other highway expansion projects, the Modal Alternative could cause a considerable contribution to cumulative impacts on residential neighborhoods, parks, schools, open space, and established local communities.

The HST Alternative could contribute to potential cumulative impacts associated with community and neighborhood cohesion and property loss. Although most alignment options of the HST Alternative will be within existing railroad right-of-way, some alignment options, such as the southern mountain crossings through the Antelope Valley area, would create new transportation corridors and potentially result in localized impacts on community cohesion. Combined with other transit (light rail and commuter rail) and roadway projects considered for this cumulative impact analysis, as listed in Appendix 3.17-A, these localized impacts could contribute to cumulative community/neighborhood impacts. Under the HST Alternative, between 53 mi and 88 mi (85 km and 142 km) of rail alignment and station locations (7% to 11% of total alignment distance) would affect high-impact land uses (new corridor in residential areas and parks), and between 92 mi and 145 mi (148 km and 233 km) of track alignment and station locations (11% to 17% of alignment distance) would affect medium impact land uses (widening existing corridors in residential and commercial business areas). These impacts, in combination with other transit extension and roadway projects, could cause a considerable contribution to potential cumulative impacts on various property types, neighborhoods, and communities.

Program-level mitigation for Modal and HST Alternative contributions to the land-use compatibility, communities and neighborhoods, property, and environmental justice cumulative impacts, as discussed in Chapter 3 (Sections 3.7.5, 3.7.6), include design practices to maximize use of existing rights-of-way and incorporating strategies for stations to incorporate transit oriented design; and coordination with cities and counties in each region to ensure that project facilities would be consistent with land use planning processes and zoning ordinances.

G. AGRICULTURAL LANDS

According to 2001 records (American Farmlands Trust 2003; California Department of Food and Agriculture 2002), California has approximately 27.7 million ac (11.2 million ha) of land in agricultural use, representing approximately 4% of the nation's total farmland operations. Six of the top ten California agricultural counties are located in the Central Valley (as described in Chapter 3, Section 3.8.3). According to the 2001 estimate, in the decade between 1988 and 1998, approximately 497,000 ac (201,129 ha) of farmland was converted to non-agricultural use due to urbanization. Based on the present pace of farmland conversion to non-agricultural use within the state, it is anticipated that by 2020 under the No Project Alternative, the state may have lost nearly 845,000 ac (341,960 ha) of farmland to urban development. This amount would represent a reduction of approximately 3% in the state's 27.7 million ac (11.2 million ha) of farmland. Therefore, it is anticipated that significant cumulative farmland conversion impacts associated with past, present, and reasonably foreseeable future projects within the study will occur.

For the Modal Alternative, potential impacts on farmland beyond the No Project Alternative impacts would include approximately 613 ac (248 ha) of prime farmland, 90 ac (36 ha) of unique farmland, 242 ac (98 ha) of farmland of statewide importance, and 173 ac (70 ha) of farmlands of local importance. The total agricultural land area impacted under the Modal Alternative would be approximately 1,118 ac (452 ha). Of the nearly 845,000 ac (341,960 ha) projected for conversion to non-agricultural use by 2020 (California Department of Conservation 2000), the Modal Alternative would represent less than 0.5% of additional farmland conversion. However, the potential reduction

of farmland from the Modal Alternative could nonetheless be a considerable contribution to the overall potential cumulative impact on agricultural land throughout the state.¹

Potential direct impacts on farmland from the proposed HST Alternative would vary based on the alignment options selected. The ranges of potential impacts would be 1,514 ac (613 ha) to 1,907 ac (772 ha) of prime farmland, 200 ac (81 ha) to 545 ac (221 ha) of unique farmland, 814 ac (329 ha) to 1,077 ac (436 ha) of farmland of statewide importance, and 141 ac (57 ha) to 331 ac (134 ha) of farmlands of local importance, according to the land designations in the Farmland Mapping and Monitoring Program (FMMP). The total potential impact on agricultural lands throughout the study area would vary between 2,559 ac (1,036 ha) and 3,850 ac (1,558 ha), depending on the alignment options. Of the nearly 845,000 ac (341,960 ha) projected for conversion to non-agricultural use by 2020 (California Department of Conservation 2000), the HST Alternative would represent less than 0.5% of additional farmland conversion. However, the potential reduction of farmland from the HST Alternative could nonetheless be a considerable contribution to the overall potential cumulative impact on agricultural land throughout the state.

Program-level mitigation for Modal and HST Alternative contributions to the agricultural conversion cumulative impacts, as discussed in Chapter 3 (Sections 3.8.5, 3.8.6), include design practices to avoid agricultural land conversion through maximizing use of existing rights-of-way to minimize encroachment on additional agricultural lands; utilizing aerial structure or tunnel alignments to allow for vehicular and pedestrian traffic access across the alignment; and reducing the new right-of-way to 50 feet in constrained areas. Mitigation measures may also be applied through project level environmental review and could include securing easements, participating in mitigation banks, increasing permanent protection of farmlands at the local planning level, and coordinating with various local, regional, and state agencies support farmland conservation programs.

H. AESTHETICS AND VISUAL RESOURCES

The aesthetic and visual quality analysis focused on potential impacts on visual resources (particularly scenic resources, areas of historic interest, natural open space areas, and significant ecological areas) along the proposed corridors for the Modal and HST Alternatives and around potential HST station sites, as described in Chapter 3 (section 3.9.2). Based on the expected impacts related to past, present, and reasonably foreseeable future projects within the study area, it is anticipated that significant cumulative impacts to aesthetic and visual resources would occur.

The Modal Alternative, when combined with other projects along other corridors in the same five regions, would likely contribute to cumulative impacts on visual resources throughout the study area. The Modal Alternative would contribute to temporary cumulative impacts on visual quality from highway construction activities such as construction equipment and materials in adjacent staging areas, construction-related signage, *k-rails*,² and night lighting. The Modal Alternative, in combination with multiple projects in other highway and rail corridors in the region, would add an estimated 2,970 lane mi (4,780 lane km) to intercity highways statewide, which would require more than 10 years to complete. The construction activities (e.g., earth disturbance, removal of vegetation, dust), construction equipment (e.g., cranes, bulldozers, trucks), and materials staging areas would be highly visible to motorists and adjacent residents and businesses over a prolonged period, and would detract from landscape features along the corridors.

The Modal Alternative would also have long-term effects on visual resources from the additional pavement and added width of highway structures (interchanges, ramps, bridges), as well as noise

¹ This analysis is based on the use of FMMP databases (California Department of Conservation, 2000) and does not include field verification of the listings.

² *K-rails* are concrete barriers used to separate travel lanes from construction areas.

barriers, retaining walls, and open cuts in steep terrain. Dominant landscape characteristics within the study area would be changed along extensive stretches of highway that traverse a variety of landscape types. These landscape changes may not be considered significant individually because they are additions to existing infrastructure. When the alterations are combined with projects in other corridors in the five regions, however, the Modal Alternative could contribute to substantial cumulative visual effects over the next 17 years, by which time the improvements are expected to be completed and in operation. In the natural open space and rural landscapes, widening a narrow two- or four-lane highway would have direct visual impacts and could contribute to cumulative visual impacts on the line, form, texture, and color of the highway. Expanding runways for airports would enlarge areas of visual effect and increase the presence of airports in the landscape. Within the suburban and urban areas, the Modal Alternative could alter the existing landscape and thereby contribute to potential cumulative visual impacts from expanded airports, widened highways, elevated portions of highway, and added noise walls.

The proposed HST Alternative could also contribute to both short- and long-term potential cumulative impacts on visual resources. Construction of the system would have short-term potential impacts on visual resources, similar to those described above for the Modal Alternative. Construction equipment, staging areas with construction materials, signage, and night lighting would be visible from adjacent properties and roadways during the construction period. The number of years such disruptions would continue would be similar for the Modal and HST Alternatives (i.e., about 10 to 17 years system-wide; however, potentially a few months to 2 years for most local areas).

Long-term visual changes would result from the introduction of 700 mi (1,127 km) to 750 mi (1,207 km) of a new transportation system that would be visible along many major highways and rail corridors connecting the metropolitan areas of the state. The track, catenary, fencing, soundwalls (where included), elevated guideway (where included), and trains themselves would introduce a linear element into the landscape that could contribute to potential cumulative visual impacts when considered with the strong linear element of the existing highway, rail facilities, and transmission lines that the HST would parallel for much of the system. HST lines in new corridors could have significant cumulative effects on visual resources. The significance of the visual change would vary by location, depending on the sensitivity of the landscape and the compatibility with existing landscape features.

Program-level mitigation for Modal and HST Alternative contributions to the cumulative impacts to aesthetic and visual resources, as discussed in Chapter 3 (Sections 3.9.6, 3.9.7), include design practices that will incorporate local agency and community input during subsequent project level environmental review in order to develop context sensitive aesthetic designs and treatments for infrastructure. Mitigation measures may also be applied through project level environmental review and could include design of facilities that integrate into landscape contexts, reducing potential view blockage, contrast with existing landscape settings, and light and shadow effects.

I. PUBLIC UTILITIES

Construction of multiple linear facilities (e.g., highway expansions, rail extensions, pipelines, transmission lines) and other reasonably foreseeable future projects in the study area would create cumulative impacts on public utilities and future land use opportunities because of right-of-way needs and property restrictions associated with these types of improvements, as discussed in Chapter 3 (Section 3.10.3). These multiple facilities would place constraints on future development, including future development of public utilities. Based on the expected impacts related to past, present, and reasonably foreseeable future projects within the study area, it is anticipated that significant cumulative impacts to public utilities would occur.

Although the Modal Alternative would not result in construction of new linear facilities and the HST Alternative would utilize a large amount of existing right-of-way, extensive utility relocation with either alternative could cause a considerable contribution to cumulative impacts on public utilities. Program-level mitigation for Modal and HST Alternative contributions to the cumulative impacts to public utilities, as discussed in Chapter 3 (Sections 3.10.6, 3.9.7), include design practices that will avoid potential conflicts, at the project-level analysis, to the extent feasible and practical. At the project-level, coordination with utility representatives during construction in the vicinity of critical infrastructure will occur. Design methods to avoid crossing or using utility rights-of-way include modifying both the horizontal and vertical profiles of proposed transportation improvements. Emphasis would be placed on detailed alignment design to avoid potential contribution to cumulative impacts from linear facilities on land use opportunities and to minimize conflicts with existing major fixed public utilities and supporting infrastructure facilities.

J. HAZARDOUS MATERIALS AND WASTES

Although past, present, and reasonably foreseeable future projects within the study area could cause cumulative impacts from hazardous materials and waste, neither improvements to highways and airports under the Modal Alternative nor implementation of the proposed HST Alternative would directly or indirectly generate hazardous materials or wastes. Any hazardous wastes encountered through ground-disturbing activities during construction of either alternative would be handled and disposed of in accordance with regulatory requirements. Therefore, neither alternative would cause a considerable contribution to cumulative hazardous material and waste impacts.

K. CULTURAL AND PALEONTOLOGICAL RESOURCES

As described in Chapter 3 (Section 3.12.3), it is not realistically feasible to identify or quantify the impacts to cultural and paleontological resources at a program level analysis. However, it is expected that as a result of past, present, and reasonably foreseeable future projects, there would be a cumulative impact related to cultural and paleontological resources.

The Modal Alternative has the potential to result in impacts on archaeological resources, historic structures, and paleontological resources in the five regions analyzed. Archaeological resources and historical structures would potentially be impacted by airport expansion and the expansion of existing highway rights-of-way necessary for additional lanes under the Modal Alternative. The greatest potential for impacts is on paleontological resources because there are many areas where existing highways cross formations with high paleontological sensitivity, and any construction in these areas could disrupt these resources. Regarding historic structures, although potential impacts could be mitigated for individual projects, the cumulative effects of projects along multiple corridors in a region over time could potentially affect the integrity of a historical district. Therefore, impacts from implementation of the Modal Alternative are expected to be a considerable contribution the cumulative impact to cultural and paleontological resources (Appendix 3.17-A).

The proposed HST Alternative could also contribute to potential cumulative impacts on archaeological resources, historical structures, and paleontological resources in the five regions analyzed, although fewer corridors would be affected overall. Potential impacts would likely occur in areas that cross formations with paleontological sensitivity and in areas where the HST Alternative alignments use existing rail corridors, because these corridors tend to be surrounded by historical structures and districts. In addition, like the Modal Alternative, the HST Alternative could contribute to potential cumulative impacts on historic districts combined with other projects over time. Therefore, impacts from implementation of the Modal/HST Alternative are expected to be a considerable contribution the cumulative impact to cultural and paleontological resources.

Program level mitigation for the cumulative impacts to cultural and paleontological resources, as discussed in Chapter 3 (Section 3.12.6) relate to avoidance measures through identification of sensitive resources within the project level analysis and project design refinement and careful selection of alignments. At a program level, continued consultation with SHPO would occur to define and describe general procedures to be applied in the future for fieldwork, method of analysis, and the development of specific mitigation measures to address effects and impacts to cultural resources, resulting in a programmatic agreement between the Authority, FRA and SHPO. In addition, consultation with Native American tribes would occur. Subsequent project-level field studies to verify the location of cultural resources would offer opportunities to avoid or minimize direct impacts on resources, based on the type of project, type of property, and impacts to the resource (see Chapter 3, Section 3.12.6 for more detail on particular mitigation measures that should be applied through project-level environmental analysis).

L. GEOLOGY AND SOILS

As described in Chapter 3 (Section 3.13.3), although it is expected that planned projects within the study area would incorporate safeguards as part of the development, design, and construction process, it would not be possible to eliminate or mitigate all geologic hazards. Based on the expected impacts related to past, present, and reasonably foreseeable future projects within the study area, it is anticipated that significant cumulative impacts to geology and soils would occur.

Both the Modal and HST Alternatives could impact slope stability in various proposed locations of cut and fill. Some construction activities, such as placing a building or fill material on top of a slope or performing additional cuts at the toe of a slope, can decrease the stability of the slope. These activities, when combined with similar activities from other projects in the region, could cause a considerable contribution to the cumulative impact to geology and soils related to slope stability in areas susceptible to slope failure. Pumping or construction dewatering associated with the Modal and HST Alternatives in segments with tunneling or extensive earthwork would potentially impact the ground surface and could result in subsidence at some locations. This could cause a considerable contribution to cumulative impacts to geology and soils related to subsidence if other projects under construction in the area also needed to dewater from the same drainage basin.

Program-level mitigation for Modal and HST Alternative contributions to the cumulative impacts to geology and soils, as discussed in Chapter 3 (Sections 3.13.5, 3.13.6), include design practices to prepare extensive alignment studies to ensure that potential effects related to major geologic hazards such as major fault crossings, oil fields, and landslide areas, will be avoided. Mitigation for potential impacts will be developed on a site-specific basis, based on detailed geotechnical studies to address ground shaking, fault crossings, slope stability/landslides, areas of difficult excavation, hazards related to oil and gas fields, and mineral resources.

M. HYDROLOGY AND WATER RESOURCES

As described in Chapter 3 (Section 3.14.3), although it is expected that impacts to hydrologic and water resources from planned projects within the study area would be limited through incorporation of typical design and construction practices to meet permit conditions, it would not be possible to eliminate or mitigate all impacts to hydrology and water resources. Based on the expected impacts related to past, present, and reasonably foreseeable future projects within the study area, it is anticipated that significant cumulative impacts to hydrology and water resources would occur.

Improvements to transportation infrastructure associated with the Modal Alternative (primarily additional highway lanes and airport runways) would significantly encroach into sensitive hydrologic resources, including approximately 5,500 ac (2,226 ha) of floodplains, approximately 39,520 linear ft (12,045 linear m) of streams, and approximately 25 ac (10 ha) of lakes, and approximately 32,000 ac

(12,950 ha) of groundwater areas. New infrastructure associated with the Modal Alternative would add approximately 4,640 total ac (1,878 total ha) of impervious surface within the study area (100 ft [30 m] from the centerline of proposed alternative corridors and direct footprint of facilities, including corridors and facilities that would undergo upgrades/expansions), which would decrease groundwater recharge and increase stormwater runoff and flooding potential. Therefore, implementation of the Modal Alternative could cause a considerable contribution to potential cumulative impacts on hydrologic resources.

The proposed HST Alternative could also contribute to potential cumulative impacts on hydrologic resources but to a lesser extent than the Modal Alternative (up to 3,873 ac [1,567 ha] of floodplains, 32,400 linear ft [32,400 linear m] of streams, and 27 ac [11 ha] of lakes, and 17,113 ac [6,925 ha] of groundwater areas). The amount of impervious surface associated with the HST Alternative would be much less than that of the Modal Alternative because much of the HST facilities would consist of permeable fill (an estimated 30% of the alignment would be elevated or in tunnel). Design characteristics such as a relatively narrow alignment width and fewer columns required to support HST structures than modal structures would result in fewer hydrologic impacts. Depending on specific designs, the improvements under the HST Alternative could have fewer impacts on floodplain and surface water resources than the Modal Alternative; however, implementation of the HST Alternative could cause a considerable contribution to potential cumulative impacts on hydrologic resources.

Program-level mitigation for Modal and HST Alternative contributions to the cumulative impacts to hydrology and water resources, as discussed in Chapter 3 (Sections 3.14.5, 3.14.6), include design practices to maximize use of existing rights-of-way to minimize potential impacts on water resources. Avoidance and minimization measures would be incorporated into the development, design, and implementation phases at project level environmental analysis. In addition, close coordination will occur with the regulatory agencies to develop specific design and construction standards for stream crossings, infrastructure setbacks, erosion control measures, sediment controlling excavation/fill practices, and other best management practices. In addition, mitigation strategies specific to reconstruction, restoration, or replacement of the resource will occur, in close coordination with state and federal resource agencies, related to flood plains; surface waters, runoff, and erosion; and groundwater.

N. BIOLOGICAL RESOURCES AND WETLANDS

The analysis of potential impacts on biological resources and wetlands includes sensitive plant communities, sensitive habitats of concern, special-status species, marine and anadromous fish habitat, riparian corridors, wildlife habitats, wildlife movement corridors, jurisdictional wetlands, and waters of the U.S. that would require a permit under Section 404 of the Clean Water Act (and would also require documentation of compliance with EPA's Section 404b(1) Guidelines). As described in Chapter 3 (Section 3.15.3), although it is expected that impacts to biological resources and wetlands from planned projects within the study area would be limited through incorporation of typical design and construction practices to meet permit conditions, it would not be possible to eliminate or mitigate all impacts to biological resources and wetlands. This would be in addition to existing biological habitat losses that have occurred as well as the estimated 90 percent of wetlands already lost in California due to past development (see Silva, ed., *Can We Save the Last 7 percent of California's Wetlands?*, 1 Env'tl. Monitor 2 (1990)). Based on the expected impacts related to past, present, and reasonably foreseeable future projects within the study area, it is anticipated that significant cumulative impacts to biological resources and wetlands would occur.

The additional land required and the linear features added under either the Modal or HST Alternative could cause a considerable contribution to the potential for cumulative impacts on biological resources and wetlands throughout the study area (1,000 ft [305 m] on either side of alignment

centerlines and around stations in urbanized areas, 0.25 mi [0.40 km] on either side of alignment centerlines and around stations in undeveloped areas, and 0.50 mi [0.81 km] on either side of alignment centerlines and around stations in sensitive areas) in the five regions evaluated.

The Modal Alternative would have potential impacts on sensitive biological resources and wetland habitats. The additional highway lanes, and widening of bridges and overpasses associated with the Modal Alternative would affect approximately 1,476 ac (597 ha) of sensitive habitat, 100 ac (40 ha) of wetlands, and 90 special-status species throughout the study area. Additionally, there would be potential impacts on existing wildlife movement corridors and marine/anadromous fish resources. Therefore, when combined with the potential impacts of other highway, water, and conventional rail projects in the five regions, the Modal Alternative could contribute to potential cumulative impacts on these same resources.

Similar to the Modal Alternative, the HST Alternative would potentially have impacts on sensitive biological resources and wetlands and could contribute to potential cumulative impacts on these resources when combined with other foreseeable projects (Appendix 3.17-A) in the five-region study area. Portions of the HST Alternative would use existing rail alignments and would therefore not result in direct disturbance of sensitive habitats. The potential for indirect noise effects on biological resources is addressed in Section 3.4, *Noise and Vibration*. Although there is a potential for cumulative impacts on biological resources from increased noise from projects in specific areas, the information for assessing this potential additive effect cannot be considered at this program level of analysis and would be addressed when site-specific analysis is completed in a subsequent phase of evaluation.

The additional embankments and bridges associated with the proposed HST Alternative would potentially affect approximately 1,201 ac (486 ha) to 1,568 ac (635 ha) of sensitive habitat, 30 ac (12 ha) to 89 ac (36 ha) of wetlands, and 67 to 84 special-status species throughout the study area. Wildlife movement corridors may be affected where the HST alignment would not be in an existing rail or highway corridor and would traverse a natural area (e.g., Diablo Range in the Bay Area to Merced region) or where there is habitat use in existing rights-of-way (where wildlife movement occurs across roads and rail lines where fences are not obstructing movement).

Program-level mitigation for Modal and HST Alternative contributions to the cumulative impacts to biological resources and wetlands, as discussed in Chapter 3 (Sections 3.15.5, 3.15.6), include design practices to maximize use of existing rights-of-way to minimize potential impacts on biological resources and wetlands. Avoidance and minimization measures would be incorporated into the development, design, and implementation phases at project level environmental analysis. In addition, close coordination will occur with the regulatory agencies to develop specific design and construction standards for stream crossings, infrastructure setbacks, monitoring during construction, and other best management practices. In addition, mitigation strategies specific to reconstruction, restoration, or replacement of the resource will occur, in close coordination with state and federal resource agencies, related to wetlands. The HST Alternative would generally be located within or adjacent to existing transportation corridors or would be in tunnel or elevated through mountain passes and sensitive habitat areas. During project-level environmental review, field studies would be conducted to verify the location, in relation to the HST alignments, of sensitive habitat, wildlife movement corridors, and wetlands. These studies would provide further opportunities to minimize and avoid potential impacts on biological resources through changes to the alignment plan and profile in sensitive areas. For example, the inclusion of design features such as elevated track structures over drainages and wetland areas and wildlife movement corridors would minimize potential impacts to wildlife and sensitive species.

O. SECTION 4(F) AND 6(F) RESOURCES (PUBLIC PARKS AND RECREATIONAL RESOURCES)

As discussed in Chapter 3 (Section 3.16), Section 4(f) and 6(f) Resources include publicly owned parklands, recreation lands, wildlife and waterfowl refuges, and historic sites that are covered by Section 4(f) of the DOT Act of 1966 and Section 6(f) of the Land and Water Conservation Fund Act of 1965. Although it is expected that impacts to 4(f) and 6(f) resources from planned projects within the study area would be limited through incorporation of typical design and construction practices to avoid these resources, it would not be possible to eliminate or mitigate all impacts. Therefore, based on the expected impacts related to past, present, and reasonably foreseeable future projects within the study area, it is anticipated that significant cumulative impacts to 4(f) and 6(f) resources would occur.

The expansion of existing highway and airport networks associated with the Modal Alternative would potentially impact approximately 147 various types of Section 4(f) and 6(f) resources (i.e., parkland and recreational resources). When combined with the impacts of other highway and transit expansion projects in the region, the potential impacts of the Modal Alternative could cause a considerable contribution to potential cumulative impacts on parklands and recreational resources throughout the study area.

The proposed HST Alternative could also contribute to the cumulative impact on parkland resources. The impacts on parkland resources from the HST Alternative would be less extensive than the Modal Alternative, since it is possible to plan the HST alignment, stations, and other facilities with the intent to avoid or minimize potential effects by routing the train around, above, or below an identified resource. Depending on the system of alignment options selected, the HST Alternative could result in impacts on 46 to 96 parkland resources. When combined with the impacts of other highway and transit expansion projects in the region, the potential impacts of the HST Alternative could cause a considerable contribution to potential cumulative impacts on parklands and recreational resources throughout the study area.

Program-level mitigation for Modal and HST Alternative contributions to the cumulative impacts to 4(f) and 6(f) resources, as discussed in Chapter 3 (Sections 3.16.6, 3.16.7, 3.16.8), include design practices to maximize use of existing rights-of-way to minimize potential impacts on biological resources and wetlands. Avoidance and minimization measures would be incorporated into the development, design, and implementation phases at project level environmental analysis. In addition, close coordination will occur with the regulatory agencies to develop specific design and construction standards for stream crossings, infrastructure setbacks, monitoring during construction, and other best management practices. In addition, mitigation strategies specific to reconstruction, restoration, or replacement of the resource will occur, in close coordination with state and federal resource agencies, related to wetlands. During project-level environmental review, field studies would offer the opportunity to avoid or minimize direct or indirect impacts on parklands by making adjustments in the alignment plan or profile. In the event that, during project level environmental analysis, it is determined that the alternative cannot avoid being located in close proximity to 4(f) and 6(f) lands, mitigations related to natural, cultural, aesthetic, and recreational impacts would be incorporated, including compensation for temporary and permanent loss of park and recreation uses; inventory and recordation of historic features removed; and provision of alternative shuttle access for park visitors; restoration of park features post construction.

3.18 CONSTRUCTION METHODS AND IMPACTS

This section describes the construction methods and related types of effects considered for the No Project, Modal, and High-Speed Train (HST) Alternatives within the five project regions. These construction methods are the basis for assessing and qualifying the potential environmental impact from construction activities. These construction methods would be applied to prepare, construct and implement typical highway, airport and HST alignment improvements that make up the alternatives.

3.18.1 Construction Method Approach

This section identifies the types of construction (highway, airport, and rail alignment) associated with the alternatives, describes the typical construction sequence and methodology for each type of construction, and discusses potential construction related impacts. The construction of highway improvements are a common element of the No Project, HST and Modal Alternative. Improvements that make up the alternatives are grouped by type of construction and their relationship to the system alternatives indicated in Table 3.18-1.

TABLE 3.18-1
System Alternative Construction Types

Improvement Type	System Alternative		
	No-Build	High Speed Train	Modal
Expanded Highway	X	X	X
Airport Runway			X
Airport Terminal			X
HST Alignment		X	
HST Station/Facility		X	

X = Common construction type.

3.18.2 Highway Improvements

Improvements to existing highways that are planned and programmed are included in the No Project, HST and Modal Alternatives. The Modal Alternative includes many additional improvements that add lanes to existing highways. Improvements to existing highways include:

- safety improvements
- straightening the alignment
- interchange improvements
- Access and terminal/station road improvements
- limiting access
- adding ramp meters
- adding a truck climbing lane
- adding new auxiliary lanes
- adding new HOV lanes
- adding new general use lanes

3.18.3 Highway Improvements

A. CONSTRUCTION WORKSITE CHARACTERISTICS

The worksite for a highway capacity improvement project is the existing highway right-of-way and additional right-of-way (including any temporary construction easements) that has been acquired for the project. The defining characteristic of this worksite is the need to maintain traffic on the existing highway during construction of the improvement.

During construction, traffic is first shifted to one side of the existing roadway while the opposite side is improved (new retaining walls and pavement installed to widen the roadway, barrier installed or replaced, etc.), then traffic is shifted back onto the newly improved portion while the other side is improved. Operational issues associated with construction are complicated and require significant coordination with the contractors and responsible agencies.

B. TYPICAL CONSTRUCTION SEQUENCE (CONSTRUCTION METHOD)

The typical construction sequence would be:

- Mobilization and site preparation – Clear any remaining existing buildings or other improvements from any new right-of-way.
- Initial traffic control phase – Implement a plan for the temporary protection and direction of traffic. The initial traffic control plan phase would probably include construction of new sound walls along the new edge of right-of-way.
- Repeat for each traffic control phase – Remove the portions of existing structures scheduled to be removed during the current traffic plan phase; construct the portions of new structures and bridges, existing structure widening and existing embankment widening or excavations scheduled to be built during the current traffic plan phase; widen pavement and install temporary pavement markings. Repeat for the next phase of the traffic control plan.
- Final traffic control plan phase – Construct new pavement wearing surface across entire width of each direction of roadway and install final pavement markings.
- Finishes – Construct elements such as signage and landscaping (this phase may start prior to the final traffic control phase).

Mobilization and Site Preparation

The key mobilization activity would be to develop a traffic control plan for the temporary protection and direction of traffic. If the capacity improvement project is expanding the highway right-of-way, site preparation would include clearing the new right-of-way of conflicting structures, obstructions and utilities. If the project does not include new right-of-way, little site preparation work can be started until a plan for the traffic plan is implemented.

Minor capacity improvement projects generally don't require sufficient excavation or embankment to justify developing new material sources or waste sites. Major highway widening may justify opening (or more likely re-opening) a quarry or other aggregate source, and setting up a rock crusher. A project that includes replacement of the existing structures or pavement may well include an aggregate (pavement) crushing plant to recycle used pavement into new aggregate. The crushing plant would not be mobilized until sufficient material has been removed to allow for several months of continuous operation. (If the project doesn't require recycling, then the waste material would be disposed of by the contractor, either as embankment material or at a disposal site.)

Initial Traffic Control Phase

Each traffic control phase would shift traffic away from that phase's work zone, and install temporary barriers to protect workers in the work zone from traffic. The shift can require some combination of closed lanes, narrowed lanes, and use of the pavement shoulder for through traffic.

Earthwork

The contractor would construct the retaining walls, embankments and excavations required. The design would attempt to balance cut and fill requirements, but severe terrain or urban conditions may require imported fill or exported cut material. If the overall schedule permits, the embankments would be allowed to consolidate for a year or two before pavement is placed on them. The contractor would route existing drainage that crosses the alignment through new and extended pipes or box culverts. The contractor would install inlets and pipes detention basins and outfalls for roadway drainage.

Structures

The contractor would construct grade separation, drainage and other bridges or concrete boxes required.

Pavement

The contractor would finish grading the new roadbed, install subbase, base rock and bridge approach slabs, and may pave the new roadway. The new pavement would drain to the inlets previously constructed. The contractor would construct any transition sections required. The contractor would install pavement markings on the completed roadway.

Repeat For Each Traffic Control Phase

Subsequent traffic control phases would shift traffic onto the completed portion of the work to create a new work zone. The contractor would construct/reconstruct the portion of the pavement and structures in the new work zone then shift the traffic to a new traffic control phase until all new pavement and structures are complete.

Final Traffic Control Plan Phase

For some roadway widening, when temporary barrier removed, the contractor would overlay a new pavement wearing surface across the entire roadway width. This paving could be done at night, when traffic volumes are reduced, and may take several nights. The contractor would install temporary pavement markings as the new top lift is installed. The contractor would install permanent markings after the new wearing course has aged for a week.

Finishes

Construction of the new pavement wearing course and markings may complete the project. Or construction may continue with shoulder barriers, signage and landscaping.

C. TYPICAL CONSTRUCTION IMPACTS

The impacts of any single capacity improvement project would be localized. The impacts of a program of capacity improvements underway at more or less the same time would increase, not only because of the longer work zones but also because a multitude of projects too small individually to develop their own sources may overtax commercial suppliers of aggregate and paving materials. Typical impacts may include:

- Traffic plan lane closures and lane narrowing would divert more traffic demand than would be added as a result of construction traffic.

- The existing roadway drainage would be disrupted during construction. The construction contractor would use silt fences, hay bales and other measures to control run-off and erosion.
- Roadway widening would generate waste pavement and waste structural concrete that would either be placed in landfills or recycled.
- Most roadway widening activities would not increase the ambient highway noise level. Demolition and pile driving are inherently noisy, and would be audible, but would also be of comparatively short duration.
- Much of the work setting up the traffic control phases, demolishing existing structures and final paving would take place at night, when traffic volumes are less. The night worksites would be illuminated, and the illumination may have an impact on adjacent land uses.

This section applies to the airside improvements contemplated in the Aviation element of the Modal Alternative. The purpose of the improvements would be to increase one measure of airport capacity – the number of aircraft take-offs and landings per hour – and hence the number of available passenger seats between northern and southern California. If a new runway has sufficient separation from existing runways to permit simultaneous operation, the new runway would increase airport capacity. Expanding (lengthening, widening and increasing the runway structural capacity) an existing general aviation runway could also increase an airport's commercial capacity, again only if the expanded runway is sufficiently separated from other runways to increase the number of operations.

D. CONSTRUCTION WORKSITE CHARACTERISTICS

The worksite for a new runway would be a large parcel of land contiguous with the existing airfield. Since most of the airports considered in the Modal Alternative are surrounded either by airport or commercial development or San Francisco Bay, assembling the land for a new runway would be an institutional challenge. The construction challenges would be to relocate conflicting streets and utilities, clear the site of structures, and remediate any site contamination. If the new runway is to be constructed on reclaimed land, then constructing a stable fill could be another construction challenge.

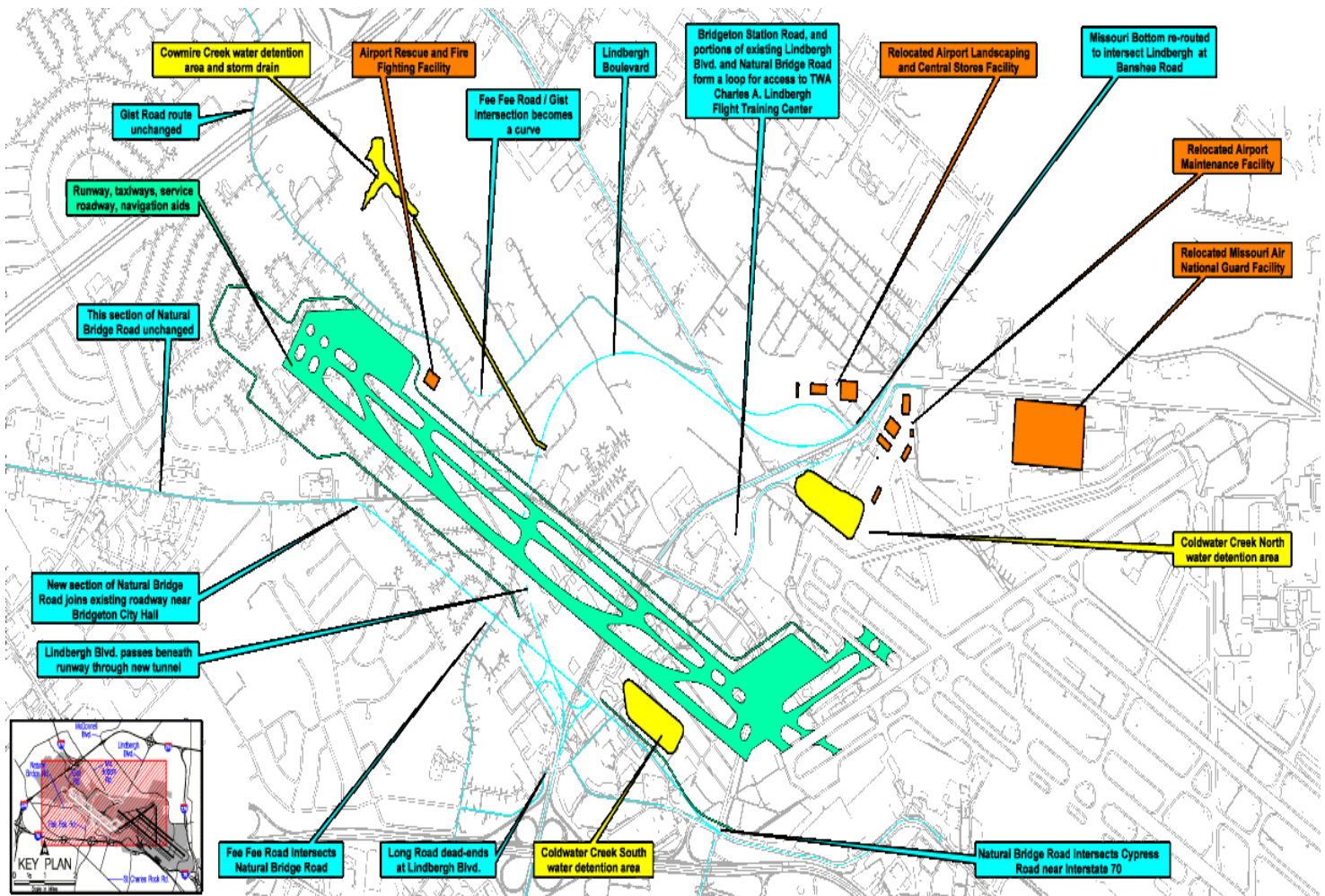
Because of the separation between runways required for simultaneous operation, there would be limited interference between new runway construction and ongoing airport operations. The new runway and associated taxiways would connect to the existing taxiway system, and that connection would have to be carefully staged to avoid interference. But the bulk of the new runway work would be sufficiently removed from airport operations so as to not limit construction. The magnitude of a new runway project is illustrated on Figure 3.18-1.

E. TYPICAL CONSTRUCTION SEQUENCE (CONSTRUCTION METHOD)

The typical construction sequence would be:

- Site Preparation – Extend (construct) new airport perimeter fencing around the new runway and a temporary barrier between the worksite and the active airfield. Clear existing buildings from the site and remediate any hazardous contamination. Construct any street relocations remote from the new runway that are a part of the program.
- Earthwork and Box Structures – Construct drainage and embankments for the new runway. Construct any structures to carry service or public roads under the new runway, and relocate the roads through the completed boxes.
- Runway Structure – Construct the new runway pavement structure. Connect the new taxiways to the existing taxiway system.
- Finishes – Construct elements such as striping, signage and lighting.

Figure 3.18-1
Representative New Runway in an Urban Airport (Lambert-St Louis International Airport)



Site Preparation

The contractor would construct any new streets around the airport perimeter, shift traffic, and close any existing streets through the new runway site. (If a street is to be relocated through a box under the new runway, then the contractor would maintain the surface street in service until the new box is constructed in the Earthwork and Box Structures phase below.)

The contractor would extend the airport perimeter fencing around the additional land required for the new runway site, and construct a temporary barrier between the worksite and the active airfield. The contractor would remove existing buildings, abandoned utilities, pavement and other improvements from the new runway site, and remediate any hazardous contamination.

If the new runway or associated taxiways displace an aircraft fuel tank farm or aircraft fuel pipelines, the contractor would place the replacement facilities in service before removing the conflicting portions of the existing system.

The contractor would set up a construction yard and a recycled pavement crusher and Portland cement concrete batch plant on a portion of the site.

Earthwork and Box Structures

If the new runway program includes a box under the runway for a private (airport) or public road, rail line, or other use the contractor would construct the new box and any associated roadway drainage pump station. The contractor would construct/extend the embankments for the new runway, and backfill over the road box, if present. The contractor would construct/extend the airfield drainage system, including detention basins if required. If any other airport utility systems cross the new runway or associated taxiways, the contractor would install those utilities before constructing the runway pavement.

Runway Structure

The contractor would finish grade the new runway and associated taxiways, install subbase and base aggregate, and pave the new runway. The contractor would tie the new runway taxiways to the existing airfield taxiways.

Finishes

The contractor would install striping, lighting, signage, landscaping and any other finish elements.

F. TYPICAL CONSTRUCTION IMPACTS

The land acquisition impacts may be substantial. Because of the large amount of land required for a new runway, and hence distance to the property line and surviving neighbors, the construction impacts would be comparatively minor. Other impacts may include:

- The construction trips generated by the new runway project may well be less than the trips generated by the land uses displaced by the new runway land acquisition program.
- Existing drainage would be disrupted and excavation or embankment faces would be vulnerable to erosion during construction. The construction contractor would use silt fences, hay bales and other measures to control run-off.
- There would be substantial volumes of demolition debris from the site preparation phase. If the existing pavement is recycled for aggregate or embankment material, the volume of waste would be reduced.
- The new runway construction noise would generally be lost in the ambient airport noise.
- While the connection of new taxiways associated with the new runway to the existing airfield taxiway network may require night work, night work on the airfield would have no effect beyond the airport perimeter.

3.18.4 Existing Airport Passenger Terminal Improvements

This section applies to the construction landside improvements at existing airports proposed in the Aviation element of the Modal Alternative. Airport landside improvement program would include terminal and parking improvements, while access roadway improvements are covered in Section 3.18.2 Existing Highway Improvements.

A. CONSTRUCTION WORKSITE CHARACTERISTICS

A unique characteristic of existing airport terminal construction is the need to maintain capacity and passenger levels of service during the construction activities. Unlike highways where traffic can be

diverted to other facilities during construction, airports must be able to accommodate demand and operations because passengers cannot typically be diverted to other facilities. As a result, airport terminal construction requires significant coordination and planning to accommodate safe and convenient access for air passenger and no-disruptions to operations.

The worksite for a new terminal, terminal expansion or parking expansion would most likely be a constrained parcel of land with limited contractor access and heavy passing traffic. Little more than the footprint of the new structure would be available for the contractor's exclusive use. Because of limited space at the worksite, the contractor would need a separate construction yard. The airport authority may furnish a site on airport property but remote from the terminal(s) for use of the contractor, or the contractor may have to secure a yard site on its own.

B. TYPICAL CONSTRUCTION SEQUENCE (CONSTRUCTION METHOD)

The typical construction sequence would be:

- Demolition and Site Preparation – Abandon existing parking or construct detour roadways as necessary to shift traffic from the worksite. Construct new entrances to existing terminal if necessary. Close the portion of existing structures (terminals or parking garages) to be removed. Construct/install construction fence and barriers. Demolish existing structures on the worksite.
- Structural Shell and Electrical/Mechanical Rough-In – Construct foundations and structural frames. Construct walls or garage parapets. Rough-in electrical and mechanical systems.
- Finishes and Tenant Improvements – Install electrical/mechanical equipment. Install jet ways. Install finishes and communications equipment. Construct tenant improvements.

The actual construction sequence may have several additional steps if the airport authority determines that it needs to stage construction, such as completing and occupying a portion of the new work before removing the last of the existing structure for replacement.

Demolition and Site Preparation

The contractor would construct detour roadways, new terminal entrances and other elements required to take existing facilities in the worksite out of service. The *other elements* could be as significant as constructing a new utility company primary service and switchgear if the existing facility is in the way of the expansion.

The contractor would close the roadway, parking or portion of the terminal to be removed, install construction fences or barriers, and demolish the existing improvements. If the existing improvements include buildings or aircraft taxiways with fuel piping, remove and hazardous materials and remediate any contamination.

Structural Shell and Electrical/Mechanical Rough-In

The contractor would construct foundations and the structural frame of the new terminal or parking structure. The contractor would enclose the new building or install garage parapets and connect the structure to site utilities. The contractor would rough-in electrical and mechanical systems, and install specialty items such as elevators, escalators, and baggage handling equipment.

Finishes and Tenant Improvements

The contractor would install electrical and mechanical equipment, including jet ways and aircraft fueling piping, if required. The contractor would install communications and security equipment, finishes and signage. The airport authority contractor may install tenant improvements, or airlines and other tenants may have their own contractors construct tenant improvements.

C. TYPICAL CONSTRUCTION IMPACTS

The largest impact would be the daily disruption of airport activities. Because of the size of airports, there would be little construction impact outside of the airport site. Others impact may include:

- Because of the tight spaces in the terminal area and existing terminal traffic, the additional construction traffic would be a problem.
- The worksite is most likely already covered by impermeable surfaces. The contractor must take care to maintain or replace the existing utilities as called for in the construction documents, but with care drainage should not be a problem.
- There would be substantial volumes of demolition debris from the site preparation phase.
- Except for pile foundations, construction noise would generally be lost in the ambient airport noise.
- While there may be a significant amount of work scheduled for overnight periods, when the contractor can close airport circulation lanes, night work in the terminal area would have no effect beyond the airport perimeter.

3.18.5 High Speed Rail Alignments

This section applies to the High-Speed Train alternative and the new construction associated with track alignment, stations, maintenance facilities, and system elements. The alignment would include at-grade, aerial, bridge, and tunnel components.

A. CONSTRUCTION WORKSITE CHARACTERISTICS

In most locations, particularly in urban areas, the worksite (new high speed rail alignment) would be close to existing railroad tracks or highway facilities. However in some locations, the worksite would follow a new alignment independent of existing railroad or highway infrastructure through undeveloped areas.

Figure 3.18-2
High-Speed Train Corridors and Stations for Continued Investigation



The new trackway, and worksite, would have three primary characteristics in high speed segments – long tangent sections connected by very large radius horizontal curves, long sections of constant grade connected by long vertical curves, and underpasses or overpasses where ever the trackway crosses any other surface transportation alignment (street or highway, railroad track, etc). In urban areas the curves are generally reduced due to development constraints, yet the curves are generally greater than the existing highway alignments.

In some locations, such as the Central Valley, the topography simplifies construction of a high speed rail trackway. The major construction effort would be to clear obstructions from an appropriately straight alignment, and to construct grade separation structures to carry crossing roads and other railroads over or under that alignment.

In other locations, especially where the high speed rail system crosses mountain ranges, the topography would challenge the construction of a high speed rail trackway. In challenging terrain the major construction effort would consist of reshaping the earth (earthwork/cut and fill), and constructing bridges and tunnels to cross over or under the existing ground surface where it is impractical to achieve the alignment geometry through reshaping.

There would be additional infrequent, but important, worksites along the alignment. These additional worksites include:

- Permanent sites such as passenger stations and terminals
- A central control facility
- Revenue service vehicle storage and maintenance facilities
- Maintenance-of-way shops and non-revenue vehicle storage
- Traction power substations and signal/communications bungalows
- Tunnel ancillary structures (tunnel emergency egress/access points, tunnel ventilation buildings, tunnel drainage pumping plants, etc).

In addition, there would be temporary (construction related) sites such as:

- Access roads and yards
- Embankment material and aggregate source sites
- Tunnel spoil and other excavation material disposal sites
- Rail welding, aggregate crushing, Portland cement concrete and asphaltic concrete plant sites.

B. TYPICAL CONSTRUCTION SEQUENCE (CONSTRUCTION METHOD)

The typical construction sequence would be:

- Mobilization and Site Preparation – Clear the alignment of conflicting improvements, including existing buildings and existing utilities if not already removed, and mobilize for construction, including establish construction yards, build site access roads if necessary, develop aggregate sources and embankment material borrow pits, and prepare excavation material and tunnel spoil waste sites.
- Heavy Civil Construction – Construct the trackbed, including embankments, cuts, bridges or tunnels, construct crossing highway or railroad grade separation structures if not already in place; also construct supporting facilities, including central control building, vehicle maintenance buildings and storage yards, passenger stations, etc.
- Railroad Systems Construction – Construct trackwork and special trackwork, traction electrification, RR signaling and communications, on the trackbed and at the supporting facilities.
- Finishes – Construct elements such as signage and landscaping (this phase would overlap with railroad systems installation and system testing).
- System testing, culminating with a period of simulated revenue service.

Mobilization and Site Preparation

Construction of the high speed rail system would require a large workforce, a large fleet of construction equipment, large quantities of aggregate and embankment materials, and a large number of manufactured products. This initial phase would develop the construction yards and

other temporary infrastructure required to assemble and organize these construction resources. The Authority's right-of-way acquisition program may have cleared the right-of-way of existing improvements (primarily buildings and utilities). If the existing improvements have not already been removed, the contractor would remove them during this phase.

During the construction mobilization phase, the contractor would set up construction yards to receive equipment and products; prepare sources (i.e. quarries and borrow pits) for aggregate and embankment materials, and cut pioneer roads as necessary to reach remote work sites (tunnel portals & shafts, bridge piers). The contractor would also remove or relocate any conflicting existing improvements (buildings, utilities, roads, track) that remain on the right-of-way.

Heavy Civil Construction

Construction of the high speed rail system would reshape a strip of land 40 to 100 ft wide to create a trackbed meeting the systems horizontal and vertical alignment requirements. (The width of the strip of land would be greater at special locations such as passenger stations or vehicle maintenance facilities.) The trackbed would be grade separated – all crossing roads and tracks would cross over or under the trackbed. Where the terrain is too severe, or the crossing roadways and other tracks too numerous, bridges or tunnels would carry the trackbed over or under the terrain.

Reshape the earth means that the contractor would remove the existing vegetation and topsoil, excavate further down (below the topsoil) or would bring in embankment material and construct engineered fill as necessary to reach the design subgrade elevation, and cap the subgrade with compacted crushed aggregate subballast. The contractor would construct drainage ditches or subdrains on either side of the alignment. The contractor would construct discharges from the ditches and subdrains at appropriate points.

Grade separated means that other facilities such as (existing or future roads, tracks, cattle paths, etc) would cross the alignment above or below the high speed rail tracks.

In any of these grade separation cases, the contractor would build grade separation structures and roadwork or trackwork on or through the structures during the heavy civil construction phase. If the structure carries the high speed rail alignment over the crossing road or track, the structure would be constructed prior to the trackbed. If the structure carries the crossing road or track over the high speed rail alignment, the structure could be constructed either before or after the trackbed. Grade separation construction would sometimes include the modification of existing or construction of new traffic signal systems.

To construct a grade separation bridge, the contractor would remove the existing vegetation and topsoil under the future structure, construct foundations under piers and bridge abutments, construct piers and abutments, construct the bridge superstructure (girders and deck), and install finish elements such as approach slabs, metal railings or solid concrete parapets. The foundations and superstructure types for any bridge would be selected in the design phase based on site-specific conditions from menus of likely foundations and superstructures. The foundation menu includes:

- Spread footings,
- Driven or drilled piling covered with a pile cap
- Cast-in-drilled-hole (CIDH) piers.

The superstructure menu includes:

- Steel or pre-cast concrete girders supporting a deck slab or,
- A cast-in-place or pre-cast concrete box with a deck slab integrated into the main girder.

Pre-cast concrete girders would also be pre-stressed; cast-in-place concrete boxes may be pre-stressed or reinforced without pre-stress.

To construct a grade separation cut-and-cover concrete box, the contractor would excavate to an elevation below the future box, then construct the box bottom slab, walls and roof, backfill the sides and over the top of the completed box, and install finish elements such as lighting.

Construction of any of these structures would require heavy equipment access to the site and maneuvering room. In addition, the cast-in-place concrete box option would require falsework to support the formwork that shapes the structure.

Bridges over severe terrain could be similar to grade separation bridges, or because of the difficulty in locating intermediate piers, severe terrain bridges could require more elaborate long span or pre-cast segmental superstructures. While special superstructures could reduce the access requirements for intermediate piers, they would still require access to both abutments and possible larger abutment work areas to prepare girders for launching across the ravine being bridged.

Tunnels through severe terrain must be excavated from headings. If the tunnel is short (up to six miles in length), it might be reasonable to construct it from a single heading. The identified preferred system has no tunnels longer than six miles

At each tunnel heading access site, there must be sufficient work area to accommodate:

- Worker and equipment staging
- Tunnel utility infrastructure (fresh air supply, compressed air, water, electric power and tunnel drainage)
- Tunnel spoil surge piles
- Storage of excavation support materials (steel ribs, rock bolts and shotcrete, pre-cast liner panels, etc).

There must be room to transfer materials going into the tunnel from trucks to tunnel railcars, and to transfer spoil coming out of the tunnel from tunnel railcars or conveyor belts to trucks. These heading access site requirements are generally independent of the excavation method (tunnel boring machine, drill and blast, or road-header) or number of tunnel bores (two single track tunnel or one double track tunnel).

After the tunnel is excavated, many of the tunnel construction access sites would become permanent tunnel support sites, such as ventilation plants, pump stations, traction power substations, emergency access points, etc.

To avoid or limit potential impacts along the surface above the tunnels, the proposal includes limiting surface access for ventilation and/or evacuation through tunnel design. The potential impacts associated with construction access roads would be greatly limited, and avoided altogether in some segments, by using in-line construction, i.e., by using the new rail infrastructure as it is built to transport equipment to and from the construction site and to transport excavated materials away from the construction area and to appropriate re-use (e.g., as fill material, aggregate for new concrete, etc.) or disposal sites. To avoid the creation of

access roads in sensitive areas, necessary geologic exploration using helicopter transport for drilling equipment and restoring sites after use would result in minimal surface disruption, and small pilot tunnels would be utilized where more extensive subsurface geology information is needed.

The heavy civil construction phase may also include construction of alignment elements to support the subsequent railroad systems phase:

- Construction of cable trough or duct banks
- Foundations for poles supporting the overhead contact system
- Site work for traction power substations

Railroad Systems Construction

The railroad systems include trackwork, traction electrification, signaling, and communications. (The rail vehicles are another key system, but are not discussed in this methodology.)

Trackwork includes both the typical track structure and special trackwork. Special trackwork is the track switches, frogs, crossing diamonds etc. that make up turnouts and crossovers. Trackwork is the first rail system to be constructed, and must be in place at least locally to start traction electrification and railroad signaling installation. Trackwork construction generally requires the welding of transportable lengths of steel running rail (traditionally 78 ft in length) onto longer lengths (approximately one quarter mile), which are placed in position on crossties or track slabs and field welded into continuous lengths from special trackwork to special trackwork.

Tie and ballast track construction typically requires that crossties and ballast be distributed along the trackbed by truck/tractor. In sensitive areas this operation can be accomplished with the established right of way corridor with delivery of the material via the constructed rail line, since in-line construction techniques are proposed. The top 4 inches or so of ballast can be delivered by railcar over the assembled track.

The traction electrification equipment to be installed includes traction power substations and the overhead contact system. (The running rails, which serve as the power return current conductor, are also part of the electrical circuit.) Traction power substations are typically fabricated and tested in a factory, then delivered by tractor-trailer, to a prepared site adjacent to the alignment. Substation spacing depends on the power supply technology selected, but is assumed at one substation every 30 miles per the Engineering Criteria Report, January 2004.

The overhead contact system is assembled in place over each track from components (poles, brackets, insulators, conductors and lots of hardware). The overhead contact system is connected by field wiring to adjacent substations.

The *Signaling* equipment to be installed includes wayside cabinets and bungalows (within established rights of way), wayside signals (at interlockings), switch machines, insulated joints, impedance bonds and connecting cabling. (The equipment supports several technologies – Automatic Train Protection, Automatic Train Control, and Positive Train Control – to control train separation, train routing at interlockings and train speed.)

The *Communications* equipment to be installed includes SCADA (System Control And Data Acquisition), telephone, radio, CCTV and visual messaging. The equipment is located in the system central control facility, wayside communications bungalows, passenger stations, tunnel equipment rooms, traction power substations, signal bungalows and other locations.

Communications data is would likely be carried on a fiber optic backbone running the length of the alignment.

Finishes

Landscaping, signage, architectural finishes and similar items involve different construction trades than heavy civil or railroad systems. The distinction between Finishes and earlier phases of work is important for labor and material scheduling, but not for the identification of work sites or overall construction methodology. Finishes would be installed at the same construction worksites as the earlier phases of construction, and would probably overlap the completion of the heavy civil and railroad systems work.

Testing and Start-Up

All work would be inspected and tested as stand-alone items as part of its construction. During system testing and start up, the work would be checked again to confirm that it functions as an integrated system. For example, integrated testing would confirm that the SCADA tunnel ventilation system status display at central control truly reflects the status of the ventilation systems, and that the ventilation equipment correctly responds to commands initiated at central control.

C. TYPICAL CONSTRUCTION IMPACTS

Overall, the HST construction sites would have numerous site-specific impacts on adjacent land uses. However some construction impacts would be more universal in nature. Typical impacts may include:

- The worksite would generate traffic on public roads leading to the site and on private haul routes running along the alignment or between the alignment and construction yards. The traffic would include construction worker commute traffic, delivery of construction supplies (bulk cement, asphalt, steel, fuel, manufactured products, etc) and movement of construction materials (primarily dirt from excavations to embankments and aggregate). In sensitive areas these operations can be accomplished with the established right of way corridor with delivery of the material via the constructed rail line, since in-line construction techniques are proposed.
- The worksite would be cleared of ground cover for construction. As a result, rainstorms would produce greater run-off and erosion than would otherwise be the case. The high speed rail construction contractor would use silt fences, hay bales and other measures to control run-off and erosion.
- The construction project has the potential to generate large quantities of material – from pavement demolition, clearing and grubbing, and soil/rock that is anticipated to be suitable for reuse in the construction of the proposed HST facilities. Potential uses include: aggregate for concrete and fill material for other portions of the line. The project would also generate a much smaller volume of waste – product packaging, broken equipment and site litter. The project may experience minor hydraulic fluid, motor oil and fuel spills that would result in the disposal of contaminated soil. The project may generate a comparatively tiny volume of hazardous waste from building demolition. The high speed rail construction contractor would collect and dispose of solid waste appropriately.
- Some heavy civil construction activities, notably pile driving and rock excavation with explosives, would be inherently noisy. Most construction activities would use large pieces of construction equipment, and the equipment would generate noise. Most of the construction worksite would be sufficiently remote so that construction noise would not cause adverse impacts on adjacent land uses. The portions of the worksite in urban areas may experience sufficient construction noise so as to have an impact on adjacent properties.

- Tunnel excavation would likely take place 24 hours per day. As a result, tunnel heading access sites would also be occupied 24 hours per day, and would be illuminated at night. The night-time illumination may have an impact on adjacent land uses.

Roadway grade separations would connect to active roads at both ends of the grade separation worksite. Particularly in urban areas that the surrounding areas are not sensitive to noise impacts, roadway traffic may be such that the connection work must be performed overnight, when traffic volumes are less. The night connection work, if required, would be illuminated, and the illumination may have an impact on adjacent land uses.

3.18.6 High Speed Rail Stations/Facilities

This section applies to the High-Speed Train alternative and the new construction associated with stations and maintenance facilities. These facilities would include urban and rural locations, potentially joint operated and joint developed locations, and at-grade, aerial, and underground locations. Passenger stations may include improvements to existing railroad stations and newly constructed stations. Substations and maintenance facilities would be newly constructed structures.

A. CONSTRUCTION WORKSITE CHARACTERISTICS

In urban areas, most worksites would include expansion or improvements to existing train stations. In rural areas, most worksites would include new construction along a new alignment independent of existing railroads.

A unique characteristic of existing railroad station construction is the need to maintain capacity and passenger levels of service during the construction activities. Unlike highways where traffic can be diverted to other facilities during construction, railroad stations must be able to accommodate demand and operations because passengers cannot typically be diverted to other facilities. As a result, railroad station improvements require significant coordination and planning to accommodate safe and convenient access for passengers and no disruptions to operations.

The worksite for a new railroad station or maintenance facility would most likely be a constrained parcel of land. The footprint of the new structure and areas for parking would be available for the contractor's exclusive use. Because parking areas and tail track/storage track areas may be available, the contractor could make use of these areas as a construction yard. If necessary, adjacent land owners may furnish temporary easements for the contractor to use as a construction yard during construction.

B. TYPICAL CONSTRUCTION SEQUENCE (CONSTRUCTION METHOD)

The typical construction sequence would be:

- Demolition and Site Preparation – Abandon identified areas within existing structures. Construct new entrances to existing stations if necessary. Close the portion of existing structures to be removed. Construct/install construction fence and barriers. Demolish existing structures on the worksite. For new facilities, perform earthwork, drainage work, and utility relocation/construction as necessary. For platform improvements or additional platform construction, the necessary track realignment and construction would be required.
- Structural Shell and Electrical/Mechanical Rough-In – Construct foundations and structural frames. Construct walls or platforms. Rough-in electrical and mechanical systems.
- Finishes and Tenant Improvements – Install electrical/mechanical equipment. Install finishes and communications equipment. Construct tenant improvements.

The actual construction sequence may have several additional steps if the railroad agency determines that it needs to stage construction, such as completing and occupying a portion of the new work before removing the last of the existing structure for replacement.

Demolition and Site Preparation

The contractor would construct detour roadways, new station entrances and other elements required to take existing facilities in the worksite out of service. The *other elements* could be as significant as constructing a new utility company primary service and switchgear if the existing facility is in the way of the expansion.

The contractor would close the roadway, parking or portion of the station to be removed, install construction fences or barriers, and demolish the existing improvements.

Structural Shell and Electrical/Mechanical Rough-In

The contractor would construct foundations and the structural frame of the new station. The contractor would enclose the new building or construct new platforms and connect the structure to site utilities. The contractor would rough-in electrical and mechanical systems, and install specialty items such as elevators, escalators, and ticketing equipment.

Finishes and Tenant Improvements

The contractor would install electrical and mechanical equipment. The contractor would install communications and security equipment, finishes and signage. The contractor may install tenant improvements, or developers and other tenants may have their own contractors construct tenant improvements.

C. TYPICAL CONSTRUCTION IMPACTS

The largest impact would be the daily disruption of station activities. There would be little construction impact outside of the station site. Other impact may include:

- Construction traffic in the vicinity of the station.
- Operations and planning coordination for platform improvements or new platforms that require trackwork realignment.
- The contractor must take care to maintain or replace the existing utilities as called for in the construction documents, but with care drainage should not be a problem.
- There may be substantial volumes of demolition debris from the site preparation phase.
- Construction noise would generally be lost in the ambient station noise.
- Night work in the urban station areas would have to be assessed for impact to residential and commercial (hotel) areas.

The additional worksites along the alignment may include:

- A central control facility
- Revenue service vehicle storage and maintenance facilities
- Maintenance-of-way shops and non-revenue vehicle storage
- Traction power substations and signal/communications bungalows
- Tunnel ancillary structures (tunnel emergency egress/access points, tunnel ventilation buildings, tunnel drainage pumping plants, etc).